UNITED STATES ATOMIC ENERGY COMMISSION

Nuclear Science Abstracts

Vol. 6 No. 23
Abstracts 6489-6725
Dec. 15, 1952

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Issue 24B will comprise a cumulation of the New Nuclear Data appearing in 1952, constituting a fourth supplement to "Nuclear Data," NBS circular 499. Extra copies will be obtainable, for approximately 25 cents, from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

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USE OF I^{131}-LABELED PROTEIN IN THE DIAGNOSIS OF PANCREATIC INSUFFICIENCY, by Austin B. Chinn, Paul S. Lavik, Richard M. Stitt, and G. Warren Buckaloo. Atomic Energy Medical Research Project, Western Reserve Univ. and University Hospitals, Cleveland. Issued Aug. 15, 1952. 11p. (NYO-4026)

NYO-4435 6576
Sedgwick Labs. of Sanitary Science, Mass. Inst. of Tech.
THE REMOVAL OF RADIOACTIVE STRONTIUM FROM WATER BY PHOSPHATE COAGULATION, by John B. Nesbitt, Warren J. Kaufman, Robert F. McCauley and Rolf Eliassen. Feb. 15, 1952. 128p. (NYO-4435)

NYO-4436 6542
Sedgwick Labs. of Sanitary Science, Mass. Inst. of Tech.
APPLICATION OF DROPPING MERCURY ELECTRODE TO B.O.D. DETERMINATIONS, by Arthur W. Busch and Clair N. Sawyer. May 27, 1952. 55p. (NYO-4436)

ORNL-1289 6624
Oak Ridge National Lab.
PHYSICS DIVISION QUARTERLY PROGRESS REPORT FOR PERIOD ENDING MARCH 20, 1952. Issued Oct. 22, 1952. 54p. (ORNL-1289)

ORNL-1347 6689
Oak Ridge National Lab.
MEASUREMENT OF BEAM ENERGY AND ENERGY DISTRIBUTION ON AN INTERNAL CYCLOTRON TARGET, by B. L. Cohen. July 1952. 12p. (ORNL-1347)

ORNL-1353 6512
Oak Ridge National Lab.
HEALTH PHYSICS DIVISION PROGRESS REPORT FOR PERIOD JANUARY 20, 1952 TO JULY 20, 1952. Issued Oct. 6, 1952. 24p. (ORNL-1353)

ORNL-1370 6589
Oak Ridge National Lab.
TURBULENT FORCED CONVECTION HEAT TRANSFER IN CIRCULAR TUBES CONTAINING MOLTEN SODIUM HYDROXIDE, by H. W. Hoffman. Issued Oct. 20, 1952. 42p. (ORNL-1370)

ORO-79 6595
Alabama Univ.
COATINGS FOR THE PROTECTION OF LOW CARBON STEEL AT ELEVATED TEMPERATURES, by J. H. Handwerk and T. N. McVay. 1952. 33p. (ORO-79)

SO-2023 6613
General Electric Research Lab.
EFFECT OF IMPURITIES ON THE SELF-DIFFUSION OF SILVER, by R. E. Hoffman and D. Turnbull. Sept. 1952. 7p. (SO-2023; RL-744)

UCLA-225 6492
Atomic Energy Project, Univ. of Calif., Los Angeles
EFFECT OF TOLUIDINE BLUE ON THE COAGULATION OF FIBRINOGEN BY THROMBIN, by Thomas J. Haley and Bonnie Rhodes. Issued Sept. 26, 1952. 10p. (UCLA-225)

UCLA-227 6650
Atomic Energy Project, Univ. of Calif., Los Angeles
AN EXTERNAL CONTROL OF THE SPACING OF THE PROJECTOR POLE-PIECE ELEMENTS OF THE RCA EMU ELECTRON MICROSCOPE, by F. W. Bishop and S. B. Elliott. Issued Oct. 8, 1952. 10p. (UCLA-227)

UCRL-1841 6695
Radiation Lab., Univ. of Calif., Berkeley
INTERPRETATION OF HIGH ENERGY p-p SCATTERING (thesis), by Don R. Swanson. May 29, 1952. 57p. (UCRL-1841)

UCRL-1894 6590
Radiation Lab., Univ. of Calif., Berkeley
HEAT TRANSFER IN FORCED CONVECTION FILM BOILING, by LeRoy A. Bromley, Norman R. LeRoy and James A. Robbers. Aug. 1, 1952. 70p. (UCRL-1894)

UCRL-1898 6577
Radiation Lab., Univ. of Calif., Berkeley
BRANCHED-CHAIN FATTY ACIDS XXVI. INFRARED SPECTRA OF SOME LONG-CHAIN 2-ALKENOIC ACIDS AND THEIR BEARING ON THE STRUCTURE OF C_{21}-PHTHIENOIC ACID, by N. K. Freeman. July 1952. 19p. (UCRL-1898)

UCRL-1905 6522
Radiation Lab., Univ. of Calif., Berkeley
THE EFFECTS OF CaEDTA UPON THE METABOLIC PATTERN OF PLUTONIUM IN RATS, by Joseph G. Hamilton and Kenneth G. Scott. Aug. 11, 1952. 15p. (UCRL-1905)

UCRL-1906 6625
Radiation Lab., Univ. of Calif., Berkeley
SUMMARY OF WEEKLY RESEARCH PROGRESS MEETINGS OF JULY 3, 10, AND 17, 1952, by Sergey S. Shewchuck. Aug. 22, 1952. 8p. (UCRL-1906)

UCRL-1915 6536
Radiation Lab., Univ. of Calif., Berkeley
SUMMARY OF THE RESEARCH PROGRESS MEETING OF JULY 24, 1952, by Sergey Shewchuck. Aug. 21, 1952. 7p. (UCRL-1915)

UCRL-1924 6626
Radiation Lab., Univ. of Calif., Berkeley
SUMMARY OF RESEARCH PROGRESS MEETING OF AUGUST 14, 1952, by Sergey Shewchuck. Sept. 4, 1952. 7p. (UCRL-1924)

UCRL-1930 6593
Radiation Lab., Univ. of Calif., Berkeley
A HIGH VACUUM HIGH SPEED ION PUMP, by John S. Foster, Jr., E. O. Lawrence, and E. J. Lofgren. Aug. 27, 1952. 12p. (UCRL-1930)

UCRL-1933 6627
Radiation Lab., Univ. of Calif., Berkeley
SUMMARY OF THE RESEARCH PROGRESS MEETING OF JUNE 12, 1952, by Margaret Foss Folden. Sept. 5, 1952. 6p. (UCRL-1933)

UCRL-1937 6696
Radiation Lab., Univ. of Calif., Berkeley
THE RANGE CORRECTION FOR ELECTRON PICKUP, by Walter H. Barkas. Aug. 29, 1952. 11p. (UCRL-1937)

UCRL-1939 6671
Radiation Lab., Univ. of Calif., Berkeley
PRODUCTION OF NEGATIVE μ MESONS AND THEIR BEHAVIOR IN NUCLEAR RESEARCH EMULSIONS, by Dora F. Sherman. Sept. 8, 1952. 17p. (UCRL-1939)

UCRL-1941 6641
Radiation Lab., Univ. of Calif., Berkeley
THE CRYSTAL STRUCTURE OF OSMIUM TETROXIDE, by Allan Zalkin and D. H. Templeton. Sept. 5, 1952. 4p. (UCRL-1941)

UCRL-1952 6628
Radiation Lab., Univ. of Calif., Berkeley
SUMMARY OF THE RESEARCH PROGRESS MEETING OF JULY 31, 1952, by Sergey Shewchuck. Sept. 18, 1952. 5p. (UCRL-1952)

UCRL-1953 6697
Radiation Lab., Univ. of Calif., Berkeley
SUMMARY OF THE RESEARCH PROGRESS MEETING OF AUGUST 7, 1952, by Sergey Shewchuck. Sept. 18, 1952. 4p. (UCRL-1953)

OTHER UNCLASSIFIED REPORTS OF SPECIAL INTEREST TO AEC LABORATORIES

AERE C/M-151 6561
Atomic Energy Research Establishment, Harwell, Berks (England)
A SIMPLE AIR PULSED AGITATOR UNIT, by K. W. Bagnall and G. L. Miles. June 17, 1952. 4p. (AERE C/M-151)

AERE C/R-958 6510
Atomic Energy Research Establishment, Harwell, Berks (England)
SYMPOSIUM ON THE HANDLING OF RADIOACTIVE AND TOXIC SUBSTANCES HELD IN TWO SESSIONS ON SEPTEMBER 10-11th AND SEPTEMBER 13-14th 1951 AT BUCKLAND HOUSE, NEAR FARINGDON, BERKSHIRE, by G. R. Hall, ed. Mar. 3, 1952. 68p. (AERE C/R-958)

AERE G/M-138 6592
Atomic Energy Research Establishment, Harwell, Berks (England)
GLASS LEAK AND CONTROL VALVES, by E. R. Harrison. June 30, 1952. 6p. (AERE G/M-138)

AERE-N/R-987 6670
Atomic Energy Research Establishment, Harwell, Berks (England)
THE INTERACTION OF NEGATIVE μ-MESONS WITH URANIUM NUCLEI, by W. Galbraith and W. J. Whitehouse. July 24, 1952. 16p. (AERE-N/R-987)

AERE-T/M-55 6688
Atomic Energy Research Establishment, Harwell, Berks (England)
EFFECT OF CORRUGATION PITCH ON PERFORMANCE OF M.R.C. LINEAR ACCELERATOR, by W. Walkinshaw and M. Ross. Jan. 1952. 10p. (AERE-T/M-55)

AERE T/R-972 6723
Atomic Energy Research Establishment, Harwell, Berks (England)
THE TRANSPORT THEORY OF A POINT SOURCE OF NEUTRONS ON THE FREE SURFACE FO A HALF SPACE, by J. P. Elliott. 1952. 22p. (AERE T/R-972)

AERE-X/M-85 6603
Cambridge Univ. (England)

INTERACTIONS BETWEEN SOLID AND LIQUID METALS AND ALLOYS; SECOND ANNUAL TECHNICAL REPORT, by V. W. Eldred. Sept. 1951. 72p. (AERE-X/M-85)

CRR-495 6596
Atomic Energy Project (Canada)
NATIONAL RESEARCH LABORATORIES JOINT REPORT [OF THE] DIVISIONS OF MECHANICAL ENGINEERING AND ATOMIC ENERGY [ON] AERIAL PROSPECTING FOR RADIOACTIVE MATERIALS, by E. A. Godby and S. H. G. Connock, National Research Council of Canada. Div. of Mechanical Engineering and J. F. Steljes, G. Cowper, and H. Carmichael, Atomic Energy Project (Canada). Mar. 13, 1952. 93p. (CRR-495; MR-17)

LT-35 6679
Chalk River Project (Canada)
THEORY OF NUCLEAR MAGNETIC MOMENTS, by A. K. Kerman. Sept. 1952. 37p. (LT-35)

NACA-RM-E52H01 6685
Lewis Flight Propulsion Lab., NACA
LUMPED REFLECTOR PARAMETERS FOR TWO-GROUP REACTOR CALCULATIONS, by Daniel Fieno, Harold Schneider, and Robert B. Spooner. Sept. 26, 1952. 25p. (NACA-RM-E52H01)

NAVEXOS-P-733(Rev.) 6604
Committee on the Basic Properties of Liquid Metals, Office of Naval Research
LIQUID-METALS HANDBOOK, by Richard N. Lyon, ed. June 1952. 276p. (NAVEXOS-P-733(Rev.))

NBS-1647 6553
National Bureau of Standards
THERMAL PROPERTIES OF FLUORINE COMPOUNDS: HEAT CAPACITY, ENTROPY, HEAT CONTENT AND FREE ENERGY FUNCTIONS OF BERYLLIUM MONOFLUORIDE IN THE IDEAL GASEOUS STATE, by Lester Haar and Charles W. Beckett. Sept. 15, 1952. 6p. (NBS-1647)

NBS-1777 6552
National Bureau of Standards
A REVIEW OF THE PROPERTIES OF DEUTERIUM COMPOUNDS; ANNUAL BIBLIOGRAPHY—1950, by Lawrence M. Brown, Jack M. Goldstein, John J. Park, and Charles W. Beckett. Sept. 1, 1952. 112p. (NBS-1777)

NBS-1916 6640
National Bureau of Standards
FINAL REPORT [ON] GROWING BERYLLIUM OXIDE CRYSTALS, by Ernest M. Levin, Gerald F. Rynders, and Raymond J. Dzimian. July 1952. 52p. (NBS-1916)

NP-4040 6579
George Washington Univ.
FINAL REPORT [FOR THE PERIOD DECEMBER 5, 1949 THROUGH DECEMBER 4, 1951], by John Farago and Elbert B. Roberson, Jr. Mar. 31, 1952. 68p. (NP-4040; U21584)

NP-4043 6554
Cryogenic Lab., Ohio State Univ.
THE HEAT CAPACITY, HEAT OF FUSION AND HEAT OF VAPORIZATION OF HYDROGEN FLUORIDE; TECHNICAL REPORT, by Jih-Heng Hu, David White, and H. L. Johnston. July 8, 1952. 19p. (NP-4043; TR 283-19; U23918)

NP-4069 6629
New York Univ., Coll. of Engineering
COSMIC RAY PROJECT; NEUTRON PRODUCTION IN THE COSMIC RADIATION, REPORT NO. 101.15, by Arthur Beiser. [nd] 35p. (NP-4069; Report No. 101.15)

NP-4072 6550
New Jersey Zinc Co. (of Pa.)
FINAL TECHNICAL REPORT [ON] RESEARCH AND DEVELOPMENT ON PLASTIC DEFORMATION AND DIRECTIONAL PROPERTIES OF TITANIUM, by E. A. Anderson and D. C. Jillson. Aug. 15, 1952. 128p. (NP-4072; WAL-401/78-12)

NP-4075 6673
Round Hill Field Station, Mass. Inst. of Tech.
FINAL REPORT [ON] RESEARCH ON TURBULENCE AND DIFFUSION OF PARTICULATE MATTER IN THE LOWER LAYERS OF THE ATMOSPHERE [FOR] NOVEMBER 1, 1948–NOVEMBER 30, 1951, by E. Wendell Hewson, H. E. Cramer, G. C. Gill and F. A. Record. [nd] 129p. (NP-4075)

NP-4076 6498
Naval Medical Research Inst., Bethesda
THE USE OF SMALL LABORATORY ANIMALS IN MEDICAL RADIATION BIOLOGY. PART II. CORRELATION OF PHYSICAL FACTORS WITH THE BIOLOGICAL EFFECT PRODUCED IN TOTAL BODY IRRADIATION, by Friedrich Ellinger, Jasper E. Morgan, and Francis W. Chambers, Jr. May 15, 1952. 26p. (NP-4076)

NP-4077 6680
Mallinckrodt Chemical Lab., Harvard Univ.
CORRELATION OF Cl^{35} NUCLEAR QUADRUPOLE COUPLING FREQUENCIES WITH HAMMETT'S SIGMA, by Harlan C. Meal. [nd] 7p. (NP-4077)

NP-4114 6674
Solid-State and Molecular Theory Group, Mass. Inst. of Tech.
QUARTERLY PROGRESS REPORT NO. 5. July 15, 1952. 92p. (NP-4114; Quarterly Progress No. 5; U-24244)

NP-4119 6619
Laboratory for Nuclear Science, Mass. Inst. of Tech.
[TWENTY-SIXTH] PROGRESS REPORT [FOR] PERIOD MAY 31, 1952 TO AUGUST 31, 1952.] Aug. 31, 1952. 92p. (NP-4119)

NP-4119(p.1-27) 6620
Laboratory for Nuclear Science, Mass. Inst. of Tech.
CHEMISTRY OF THE FISSION ELEMENTS GROUP and COSMIC RAY GROUP and ELEMENTARY PARTICLE SCATTERING GROUP, p.1-27 of TWENTY-SIXTH PROGRESS REPORT FOR PERIOD MAY 31, 1952 TO AUGUST 31, 1952. Aug. 31, 1952. 27p. (NP-4119(p.1-27))

NP-4119(p.28-50) 6531
Laboratory for Nuclear Science, Mass. Inst. of Tech.
NUCLEAR CHEMISTRY (INORGANIC) GROUP and NUCLEAR CHEMISTRY (ORGANIC) GROUP, p.28-50 of TWENTY SIXTH PROGRESS REPORT FOR PERIOD MAY 31, 1952 TO AUGUST 31, 1952. Aug. 31, 1952. 23p. (NP-4119(p.28-50))

NP-4119(p.51-85) 6621
Laboratory for Nuclear Science, Mass. Inst. of Tech.
ONR GENERATOR GROUP and RADIOACTIVITY AND CYCLOTRON GROUP, p.51-85 of TWENTY SIXTH PROGRESS REPORT FOR PERIOD MAY 31, 1952 TO AUGUST 31, 1952. Aug. 31, 1952. 35p. (NP-4119(p.51-85))

NP-4119(p.86-92) 6622
Laboratory for Nuclear Science, Mass. Inst. of Tech.
SYNCHROTRON GROUP and THEORETICAL GROUP, p.86-92 of TWENTY-SIXTH PROGRESS REPORT FOR PERIOD MAY 31, 1952 TO AUGUST 31, 1952. Aug. 31, 1952. 7p. (NP-4119(p.86-92))

NP-4121 6515
Naval Medical Research Inst., Bethesda
PHARMACOLOGICAL STUDIES OF IRRADIATED ANIMALS. PART I. SCOPE AND METHODOLOGY, by Friedrich Ellinger. May 28, 1952. 13p. (NP-4121; U-23977)

NP-4126 6555
Bureau of Mines
BIBLIOGRAPHY ON THE DETERMINATION OF FLUORINE AND FLUORIDE ION; SYNTHETIC FUELS RESEARCH BRANCH BIMONTHLY REPORT FOR PERIOD ENDING FEBRUARY 12, 1952, by Elaine G. Aiken. Feb. 26, 1952. 9p. (NP-4126)

NRC-2667 6517
National Research Council of Canada
COBALT-60 TELETHERAPY UNIT: OUTPUT, DEPTH DOSE AND ISODOSE DISTRIBUTIONS, by W. R. Dixon, C. Garrett, and A. Morrison. Feb. 1952. 47p. (NRC-2667; PR-129)

NRL-4036 6711
Naval Research Lab.
ON THE NATURAL RADIOACTIVITY IN THE AIR, by Irving H. Blifford, Luther B. Lockhart, Jr. and Herbert B. Rosenstock. Sept. 16, 1952. 11p. (NRL-4036)

NRL-Memo-47 6587
Naval Research Lab.
THERMAL CONDUCTIVITY OF SODIUM-POTASSIUM ALLOY (77.7 wt. % POTASSIUM), by Curtis T. Ewing and Robert E. Seebold. Aug. 12, 1952. 7p. (NRL-Memo-47)

TEM-446 6599
Geological Survey
RESULTS OF RECONNAISSANCE FOR URANIFEROUS COAL, LIGNITE, AND CARBONACEOUS SHALE IN WESTERN MONTANA, by William J. Hail, Jr. and James R. Gill. Sept. 1952. 22p. (TEM-446)

NUCLEAR SCIENCE ABSTRACTS

Vol. 6 December 15, 1952 No. 23

GENERAL

ATOMIC BOMBS AND WARFARE

6489

EXAMINATION AND SALVAGING OF FOOD SUPPLIES. Winton B. Rankin. U. S. Pub. Health Repts. 67, 627-32 (1952) July.

The methods the Food and Drug Administration, Federal Security Agency, employs to determine whether foods are suitable for consumption after damage by blast, fire, or water, or contamination with radioactive materials are described. (auth)

6490

ON THE RADIOACTIVITY FOUND IN THE WESTERN SUBURB OF HIROSHIMA AFTER THE EXPLOSION OF AN ATOMIC BOMB. Fumio Yamasaki. J. Sci. Research Inst. 46, 59-67(1952) June

A few days after the explosion of an atomic bomb on Hiroshima samples of sand and mud were collected and their radioactivity and decay rates measured. About four weeks after the explosion a survey on residual activities was made in and near Hiroshima. A Lauritsen electroscope was used to measure γ activity. Data from this survey are presented.

BIOLOGY AND MEDICINE

6491

Institute for Enzyme Research, Univ. of Wis.

STUDIES ON THE CYCLOPHORASE SYSTEM. XXV. FATTY ACID OXIDATION IN THE RABBIT LIVER SYSTEM, by Vernon H. Cheldelin and H. Beinert. [nd] 26p. (AECU-2262)

A study has been made of fatty acid oxidation in the cyclophorase — mitochondrial system of rabbit liver with particular reference to the mechanism of acetoacetic acid formation. (auth)

6492

Atomic Energy Project, Univ. of Calif., Los Angeles

EFFECT OF TOLUIDINE BLUE ON THE COAGULATION OF FIBRINOGEN BY THROMBIN, by Thomas J. Haley and Bonnie Rhodes. Issued Sept. 26, 1952. 10p. (UCLA-225)

An investigation of the effect of toluidine blue on the coagulation of fibrinogen by thrombin indicates that low concentrations of the dye increase coagulation time whereas higher concentrations decrease coagulation time. Spectrophotometric analysis indicated that there was no direct combination between fibrinogen and toluidine blue under the conditions of the experiments reported. (auth)

AEROSOLS

6493

PHYSICAL PROPERTIES OF GERMICIDAL AEROSOLS AND ARTIFICIAL BACTERIAL CLOUDS. H. Kliewe and E. v. Wasielewski. Z. Hyg. Infektionskrankh. 134, 1-23 (1952). (In German)

Dispersion tendencies, sedimentation, and physical behavior of aerosols and bacterial clouds under various atmospheric conditions (relative humidity, temperature, and electric charge) were investigated. 15 tables.

RADIATION EFFECTS

6494

New England Deaconess Hospital, Boston

DEVELOPMENTAL MALFORMATIONS PRODUCED BY RADIATION; A TIMETABLE OF THEIR DEVELOPMENT, by Samuel P. Hicks. New England Deaconess Hospital, Boston and Harvard Cancer Commission and Harvard Medical School. [nd] 40p. (AECU-2264)

The malformations, especially those of the nervous system, produced in developing rats by giving single doses of radiation to the pregnant mothers on successive days during gestation are presented. The embryologic mechanisms are discussed and illustrated and a timetable of radiation damage is presented. (auth)

6495

Michigan Univ.

THE EFFECT OF GAMMA RADIATION FROM COBALT-60 ON MICROORGANISMS, by C. A. Lawrence, L. E. Brownell, and J. T. Graikoski. [nd] 13p. (AECU-2265)

A study was made of the effects of γ radiation from Co^{60} on microorganisms as measured by the number of viable organisms remaining following exposure to various doses of irradiation. Data are included on lethal effects of radiation on non-spore-forming bacteria, spore-forming aerobic bacteria, fungi, yeast, and protozoa.

6496

Michigan Univ.

FINAL REPORT [ON] UNIVERSAL SEROLOGIC REACTION FOLLOWING IRRADIATION [FOR PERIOD] JULY 1, 1949 TO JUNE 30, 1952, by Reuben L. Kahn and Fred J. Hodges. [nd] 66p. (AECU-2266)

In a discussion of the theory of the universal reaction it is stated that the reaction between lipid antigen and serum possesses characteristics of specific immunity reactions except that the antibodies are formed in response to substances apparently developed within the body. It is believed that certain lipids liberated from cells in normal catabolism undergo such chemical changes as to become foreign to the body and antigenic. These lipids call forth the production of natural auto-antibodies in health. Since the liberation of such lipids and the production of auto-antibodies are likely to be constant in health, the serologic pattern of the universal reaction is constant in health. In disease the increase in tissue break-down leads to a corresponding increase in lipid liberation and in subsequent antibody production, and hence to an increase in precipitation in the universal reaction. In certain diseases, such as in syphilis and in lepromatous leprosy, the lipids liberated are apparently antigenically distinctive; these in turn call forth homologous antibodies and distinctive serologic patterns. In irradiation and following the injection of various substances, the resulting tissue injury causes an increase in lipid liberation, in subsequent antibody production, and in precipitation in the universal reaction. Topics discussed in detail include the nature of the universal reaction, differences in serologic patterns in different individuals and population groups, the constancy of serologic

pattern in health, the reaction following the injection of horse serum, tissue lipids, and other substances, and the reaction following irradiation in rabbits, in cancer patients, and in polycythemia patients. Data are summarized graphically. Bound with this report are reprints of the following articles by the authors: Effect of Irradiation on the Universal Reaction in Cancer (see NSA 6-2812), Effect of Irradiation on the Universal Reaction in Polycythemia Vera (see NSA 6-2813), and Present Status of Universal Reaction in Health and Disease (Univ. Mich. Med. Bull. 17, 217-239(1951)).

6497

Vitro Corp. of America

QUARTERLY PROGRESS REPORT [ON] INDUSTRIAL APPLICATION OF GROSS FISSION PRODUCTS [FOR] APRIL–JUNE, 1952. July 31, 1952. 29p. (KLX-1379)

A program has been planned and work started on a study of the utilization by the food and drug industry of fission products as high-level radiation sources for product sterilization, pasteurization, and insect control. Equations have been developed for calculating dose rate as a function of size and total activity for three source geometries–hollow cylinders, solid cylinders and planes. These three geometries are considered the most suitable available for application in this work. Sample calculations have been made for such sources. Results indicate that the ultimate design of a geometrical source shape and its physical relationship to the irradiated material must be a compromise between irradiating a large amount of material in short periods such as may be anticipated on industrial conveyer belts and irradiating a small amount of material over a long period of time, approaching batch operation. The former case requires multi-megacurie sources while the latter requires megacurie sources. (auth)

6498

Naval Medical Research Inst., Bethesda

THE USE OF SMALL LABORATORY ANIMALS IN MEDICAL RADIATION BIOLOGY. PART II. CORRELATION OF PHYSICAL FACTORS WITH THE BIOLOGICAL EFFECT PRODUCED IN TOTAL BODY IRRADIATION, by Friedrich Ellinger, Jasper E. Morgan, and Francis W. Chambers, Jr. May 15, 1952. 26p. (NP-4076)

In order to obtain baseline data for further studies, and in extension of previous investigations of the senior author in the field of lethal effect of total-body irradiation, studies have been made of the effects of two types of x rays (200, 140 kvp) on male albino Swiss mice of the Institute strain. Physical data presented in the first part of this work were the guiding principles for the various exposures. By applying a quarantine period of at least 14 days prior to the use of animals in these experiments, meticulous after-care of irradiated animals, precise recording of all pertinent data, and rigid control of exposure conditions, it became possible to accomplish a high degree of accuracy of biological data. As indicated in the paper, at the LD_{50} level, even dose differences of ±2.5 per cent could be distinguished biologically under special conditions. Good agreement between physical data and biological effects has been demonstrated by means of a study of the influence of backscatter on mortality rate and in the comparison of two types of irradiation. Preliminary results are presented indicating that the exit dose appears as a suitable parameter for evaluation of the relative lethality of two different types of x rays in one animal species. It is hoped that with further extension of these studies to other species, and with a wider range of radiation factors, data will be obtained on which extrapolation to man will eventually become possible. (auth)

6499

LETHAL MUTATIONS AND THE BACTERICIDAL ACTION OF IONIZING RADIATION. K. C. Atwood and G. E. Stapleton. Naturwissenschaften 39, 330-1(1952) July. (In English)

Norman and Greenfield's objection (Naturwissenschaften 39, 22(1952)) to the possibility that the bactericidal action of ionizing radiation may be attributed to lethal mutation, since exponential survival curves are incompatible with the lethal-mutation hypothesis in cases where the bacteria are multinucleate, is considered. Their argument, that induction of recessive lethal mutations in a two-nuclei cell requires mutations in identical loci of both nuclei, is shown to be invalid by cytological and genetic evidence. Lethal mutations induced in any loci of both nuclei would be sufficient to preclude the formation of a colony. This reasoning still does not lead to the observed survival curves. Correlation of nuclear constitution of bacteria with their survival curves must take into account (1) the mode of distribution of the nuclei in the cells during division, (2) the possibility of unforeseen interactions between the nuclei, and (3) the possibility that more than one unit within the same cell may be affected by the products of a single ionizing particle.

6500

THE DEPENDENCE OF SOME BIOLOGICAL EFFECTS OF RADIATION ON THE RATE OF ENERGY LOSS. Cornelius A. Tobias. In SYMPOSIUM ON RADIOBIOLOGY. James J. Nickson, ed. New York, John Wiley and Sons, 1952. (Chapter 19).

The phenomenon of inhibition of cell division by irradiation is examined theoretically and experimentally in a set of varied conditions. 40 references.

6501

BEHAVIOR OF NUCLEIC ACIDS IN NERVE CELLS SUBJECTED TO ROENTGEN RADIATION. A. Della Beffa. Arch. psicol. neurol. e psichiat. 13, 116-27(1952) Jan. (In Italian)

Histological and cytochemical observations on cerebral, cerebellar, and spinal cord tissue of guinea pigs exposed to 900 to 3600 r of x radiation in one to three exposures are reported. 7 figures.

6502

SINGLE WHOLE-BODY X IRRADIATIONS OF THE GUINEA PIG; PRINCIPAL BIOLOGICAL EFFECTS. L. Pigoury, P. Nizza, and J. Charny. Rev. vét. militaire 7, 1-25(1952). (In French)

A total of 105 adult male guinea pigs were x-irradiated with 100, 200, 400, 500, 800, or 1000 r. The mortality rates, mean survivals, clinical effects (symptoms, temperature changes, and weight losses), blood pictures, and brief descriptions of the macroscopic lesions of the important organs are reported. (cf. NSA 6-1953)

6503

REACTION OF THE VAGINAL WALL TO INTRAVAGINAL IRRADIATION. Hans Tischer. Wien. med. Wochschr. 102, 133-6(1952) Feb. 16. (In German)

A tolerance limit of 30,000 r surface dose in 12-fold fractionated exposures has been established for the vaginal wall in intravaginal x irradiations. Higher doses, either single or fractionated, produce extensive, lasting radiation damage. Macroscopic and histological changes at various radiation levels are illustrated.

6504

SENSITIZATION BY BETA RADIATION OF BACTERIA TO EFFECTS OF HIGH AND LOW TEMPERATURES AND TO EFFECTS OF REPEATED BETA RADIATION. E. Ya. Graevskiĭ. Doklady Akad. Nauk S.S.S.R. 83, 565-8(1952) Apr. 1. (In Russian)

Colonies of Bacterium coli commune were exposed to

total doses of 0.002 to 0.85 mc-day of Ra β radiation. The sensitized colonies were then incubated at various temperatures and additional β irradiations. Survival curves are presented. The results are said to support the target theory of the action of ionizing radiation.

6505

EFFECT OF NITROGEN MUSTARD OR X- OR RADIUM-IRRADIATION TREATMENT ON THE LEVEL OF BLOOD SERUM PROTEIN-BOUND CARBOHYDRATE (POLYSACCHARIDE) IN PATIENTS WITH NEOPLASMS. J. W. Keyser. Biochem. J. 51, 46(1952) Aug.

An investigation was undertaken to find out what effect nitrogen mustard or irradiation treatment might have on the level of serum polysaccharide in patients with various neoplastic diseases, and how much of the increase in polysaccharide is due to the mucoprotein fraction. Fourteen cases were studied, polysaccharide being estimated by the orcinol method. It was found that, in general, treatment that resulted in marked clinical improvement and reduction in the size of the tumor was associated with a fall in the level of serum polysaccharide (total and mucoprotein) towards normal values, but a preliminary rise during treatment was often observed, and with relapse the polysaccharide level rose again. The mucoprotein polysaccharide rose and fell with the total polysaccharide but did not constitute a constant proportion of it. (auth)

6506

HISTOCHEMICAL AND SEROLOGICAL INVESTIGATION ON THE EFFECT OF ROENTGEN RADIATION. III. BEHAVIOR OF ACETAL PHOSPHATIDES (APh) IN SPLEEN, THYMUS, SMALL INTESTINE, KIDNEY, AND HEART MUSCLE OF THE RAT FOLLOWING WHOLE-BODY IRRADIATION WITH 1000 R. Theophil Hornykiewytsch and Günther Seydl. Strahlentherapie 88, 129-38(1952). (In German)

Sixty male rats of 100 to 120 g weight were whole-body x-irradiated with 1000 r and then sacrificed after 3, 6, 12, 24, 48, or 72 hr. Histochemical preparations showing the changes in acetal phosphatides (APh) in various tissues are illustrated. The organs or portions of organs poor in APh, e.g., spleen and thymus, proved to be particularly radiosensitive. Paneth's cells of Lieberkühn's glands in the small intestine, which are rich in APh, and kidneys and heart muscle are surprisingly resistant. The possibility of a relation between APh content and radiosensitivity is suggested. The APh also seems to play an important part in tissue regeneration. 13 figures.

6507

RADIOACTIVE GOLD Au^{198} AND ARTICULATIONS. P. Desaive and J. Closon. J. belge radiol. 24, 438-44(1951). (In French)

Colloidal Au^{198} in 3- to 12.8-mc doses was injected intravenously, intraperitoneally, or intraarticularly into rabbits. Subsequent distribution and apparent radiation-induced changes in synovial and adjacent tissues are illustrated.

6508

VARIATION OF DESOXYRIBONUCLEIC ACID IN HEPATIC CELLS FOLLOWING X IRRADIATION. A. Romanini. Boll. soc. ital. biol. sper. 28, 103-5(1952). (In Italian)

A group of 32 mice (Mus musculus) were x-irradiated on the hepatogastric region with a single dose of 1000 r, then sacrificed at the end of 1 hr, or 1, 3, or 7 days. Concentrations of desoxyribonucleic acid were determined in liver preparations with a histophotometer. An initial indefinite increase was followed by a rapid drop to 78% of normal at the end of 24 hr. The concentration then increased, reaching 125% of normal by the seventh day.

6509

FIRST BIOLOGICAL EXPERIMENTS WITH THE 31-MEV BETATRON. Hedi Fritz-Niggli. Arch. Julius Klaus-Stift. Vererbungsforsch. Jahresber. 26, 454-9(1951). (In German)

Drosophila melanogaster pupae of various ages were irradiated with 50- and 180-kev and 31-Mev x rays. Relative developmental changes are described briefly.

RADIATION HAZARDS AND PROTECTION

6510

Atomic Energy Research Establishment, Harwell, Berks (England)

SYMPOSIUM ON THE HANDLING OF RADIOACTIVE AND TOXIC SUBSTANCES HELD IN TWO SESSIONS ON SEPTEMBER 10-11th AND SEPTEMBER 13-14th 1951 AT BUCKLAND HOUSE, NEAR FARINGDON, BERKSHIRE. G. R. Hall, ed. Mar. 3, 1952. 68p. (AERE C/R-958)

The topics for general discussion at the Symposium on Handling Radioactive and Toxic Substances covered the use and design of glove boxes, remote control methods employed in handling radioactive materials, housekeeping and laboratory decontamination, and painting systems for use in active areas.

6111

Knolls Atomic Power Lab.

SEMIANNUAL PROGRESS REPORT OF DEVELOPMENT ACTIVITIES IN THE HEALTH PHYSICS UNIT [FOR] JULY–DECEMBER 1951, by KAPL Staff. Jan. 1952. 37p. (KAPL-679)

A method is reported for the spectrographic analysis of Be air samples which provides maximum sensitivity and greatly reduces the time required for analysis by existing methods. A sampling unit is described which was designed and constructed to provide a continuous, proportional sample of sanitary sewer effluent. The efficiency of the health physics iodine scrubbers was investigated and data are included. A study of the correlation of the incidence of bilobe nuclei of lymphocytes with radiation exposure is in progress.

6512

Oak Ridge National Lab.

HEALTH PHYSICS DIVISION PROGRESS REPORT FOR PERIOD JANUARY 20, 1952 TO JULY 20, 1952. Issued Oct. 6, 1952. 24p. (ORNL-1353)

Better removals of I^{131} and Sr^{89} from tap water were obtained with a mixed resin bed than with either an anion or a cation bed alone. Data are presented from an evaluation of water purification equipment for the removal of fission products. Studies are described which are carried out in connection with the survey of chemical waste storage pits. Data are presented from an evaluation of electroscopes and G-M survey meters for the measurement of radioactivity in water. An improvement is reported in the method for microscopy of nuclear track films, traversing at lowered magnification instead of scanning individual fields. Design and performance data for an electrometer for the measurement of ionizing radiation by high-frequency variation are included. A study of skin fluorescence after x-irradiation led to the conclusion that variation in light output for an individual and also between individuals was so great that dosage measurements by this method are not practical. Design is reported of an apparatus to measure the saturation effects in pocket ionization chambers at different dose rates. Progress is reported in the design and construction of instruments for fast neutron dosimetry. Aerial survey studies made from an aircraft indicate that radiation as a function of height can be expressed as a simple exponential function derived theoretically by assum-

ing a buildup from scattered radiation that is proportional to the height. Calculations for maximum permissible amounts of 90 isotopes in the human body, in water, and in air are presented in tabular form. Dosimetry measurements proposed for use in the first phase of an experiment involving exposure of animals to a mixed γ and neutron radiation field are summarized. A diagramatic drawing is included of a gas-filling apparatus used for the determination of the number of ev required to produce an ion pair in a gas and measurements made for α particles in various gases and gas mixtures are presented in tabular form.

6513

INVESTIGATION OF THE DISTRIBUTION AND ELIMINATION OF DECAY PRODUCTS OF THORIUM X PRODUCED IN VIVO. Eberhard Harbers. Z. Naturforsch. b7, 363-5 (1952) June. (In German)

The tissue distribution and excretion of decay products, even if short-lived, frequently differ greatly from those of the parent element and can constitute a hazardous complication in radioisotope therapy or tracer studies. Curves are drawn showing the variation with time of ThX (Ra^{224}), ThC (Bi^{212}), ThB (Pb^{212}), and total activity in blood cells, serum, liver, kidneys, spleen, and urine of rabbits injected with ThX. An initial increase in total activity in blood cells and liver is noted as the ThC concentration builds up.

6514

RADIATION PROTECTION MONITORING WITH FILM. H. Langendorff, G. Spiegler, and F. Wachsmann. Fortschr. Gebiete Röntgenstrahlen 77, 143-53(1952) Aug. (In German)

Suitability of film detectors for radiation monitoring is reexamined. The effects of various factors, such as latent-image fading, angle of incidence, and temperature, are considered and are shown not to cause errors outside allowable limits. Selection of film is discussed. Development of stepped calibration marks on the exposed film is recommended. Data obtained in monitoring the exposures received by 350 persons are summarized.

RADIATION SICKNESS

6515

Naval Medical Research Inst., Bethesda

PHARMACOLOGICAL STUDIES OF IRRADIATED ANIMALS. PART I. SCOPE AND METHODOLOGY, by Friedrich Ellinger. May 28, 1952. 13p. (NP-4121; U-23977)

Preliminary data on the effects of desoxyribonucleic acid, ribonucleic acid and spleen extract on radiation-induced mortality in mice are presented graphically. Methods for elucidation of the mechanisms by which pharmacological agents modify the lethal effects of ionizing radiation and the necessity of utilizing the entire lethal-dose curve for the evaluation of drug effects are discussed.

6516

BLOOD TRANSFUSION IN IRRADIATION HEMORRHAGE. J. Garrott Allen, Clair E. Basinger, Jerome J. Landy, Margaret H. Sanderson, and Daniel M. Enerson. Science 115, 523-6(1952) May.

The frequent administration of fresh blood transfusions without antibiotics in dogs failed to improve the survival rate or to ameliorate spontaneous bleeding after exposures to total-body x radiation (LD_{50}-LD_{100}). On the basis of these experiments a more cautious attitude toward the use of frequent blood transfusion alone as a therapeutic measure in the treatment of the latent symptoms of irradiation injury in man may be indicated. (auth)

RADIOTHERAPY

6517

National Research Council of Canada

COBALT-60 TELETHERAPY UNIT: OUTPUT, DEPTH DOSE AND ISODOSE DISTRIBUTIONS, by W. R. Dixon, C. Garrett, and A. Morrison. Feb. 1952. 47p. (NRC-2667; PR-129)

Measurements are reported of the radiation output and back-scatter, the depth dose, and isodose distributions in a water phantom, obtained with the 1000-c Co^{60} teletherapy unit installed in the Victoria Hospital, London, Ontario. The depth dose obtained with the Co^{60} unit was found to be definitely higher than those reported for 2-Mev x radiation.

6518

PHYSIOTHERAPY OF BILATERAL GLIOMAS OF THE RETINA. M. Appelmans, J. De Niel, and P. Lebas. Bull. soc. belge ophtalmol., 532-51(1951). (In French)

Several case histories of patients with bilateral retinal gliomas treated by radium or radiotherapy are presented. The sometimes remarkable radiosensitivity of the tumors, the relative radioresistance of the retina, and the strong tendency of the gliomas to form calcifications are noted.

6519

THERAPY OF MORBUS BECHTEREW. August Rütt. Deut. med. Wochschr. 77, 649-52(1952) May 16. (In German)

Treatment of 26 patients suffering from Bechterew's disease (rheumatoid arthritis of the spine) with peteosthor, a colloidal ThX (Ra^{224}) preparation, and gymnastics is summarized. Significant improvement not obtainable with other methods was noted. The patients almost without exception could return to work 3 to 6 months after treatment. No disadvantages were observed, but peteosthor was found to be contraindicated if the liver, kidneys, or blood-forming system were diseased.

6520

PETEOSTHOR IN BONE AND JOINT TUBERCULOSIS; A CLINICAL REPORT. K. Lindemann and F. W. Rathke. Z. Orthopäd. 82, 262-81(1952). (In German)

Numerous clinical reports on the treatment of bone and joint tuberculosis with the ThX (Ra^{224}) preparation peteosthor are summarized. The percentage of definitive healing by this treatment is below normal, and detrimental effects are often noted.

6521

POLYCYTHEMIA VERA–RADIOACTIVE PHOSPHORUS–ACUTE LEUKEMIA. Chr. J. Bjerkelund. Nord. Med. 48, 1037-8(1952) July 25. (In Norwegian)

The development of acute myeloblastic leukemia in a case of polycythemia vera treated with P^{32} is reported. Such a course of the disease seems, according to recent observations, to be much more frequent since the introduction of P^{32} as a therapeutic agent. P^{32} should therefore be reserved for complicated cases of polycythemia vera refractory to other treatment.

TOXICOLOGY STUDIES

6522

Radiation Lab., Univ. of Calif., Berkeley

THE EFFECTS OF CaEDTA UPON THE METABOLIC PATTERN OF PLUTONIUM IN RATS, by Joseph G. Hamilton and Kenneth G. Scott. Aug. 11, 1952. 15p. (UCRL-1905)

Studies indicate that the oral administration to rats of the Ca salt of (ethylenediamine)tetraacetic acid did not produce a pronounced depletion of Pu in the soft tissues and apparently had very little effect upon the skeletal content of Pu. The parenteral administration of a small amount of CaEDTA likewise appeared to be productive of little effect. An increase of urinary excretion was noted after prolonged feeding but it was not of sufficient magnitude to influence sufficiently the content of either the skeleton or soft tissues. The parenteral administration of large amounts of CaEDTA was shown to decrease the skeletal content of Pu and to

increase the absorption from intramuscular injection sites. In the rat the amounts of CaEDTA necessary to secure an appreciable increase of urinary excretion are in the toxic range. It is concluded that while the immediate use of large amounts of CaEDTA following the accidental entry of Pu into the body through cuts or abrasions may offer some promise, the use of CaEDTA for the treatment of chronic Pu poisoning is of very limited practical value.

TRACER APPLICATIONS

6523

California Univ., Berkeley. Coll. of Agriculture

SUGAR TRANSFORMATION IN LEAVES OF CANNA INDICA. I. METABOLISM OF GLUCOSE AND FRUCTOSE, by E. W. Putman and W. Z. Hassid. [nd] 34p. (AECU-2259)

The transformation of C^{14}-labeled glucose and fructose was studied in canna leaves. Infiltration of either radioactive sugar caused a rapid appearance of radioactive sucrose. When C^{14}-glucose was infiltrated, the relative specific activity of this sugar rapidly decreased, while that of the sucrose showed a parallel increase. No activity could be detected in the free fructose. However, when the sucrose was hydrolyzed to its monosaccharide constituents, the activity of the fructose was comparable to that of glucose. Likewise, infiltration of C^{14}-labeled fructose resulted in a decrease of its initial high relative specific activity, and in a simultaneous steady increase in the specific activity of the sucrose. There was no activity in the glucose but, as in the case of C^{14}-labeled glucose infiltration, the glucose and fructose produced by hydrolysis of this sucrose did not vary greatly in their activities. (auth)

6524

Atomic Energy Medical Research Project, Western Reserve Univ.

USE OF I^{131}-LABELED PROTEIN IN THE DIAGNOSIS OF PANCREATIC INSUFFICIENCY, by Austin B. Chinn, Paul S. Lavik, Richard M. Stitt, and G. Warren Buckaloo. Atomic Energy Medical Research Project, Western Reserve Univ. and University Hospitals, Cleveland. Issued Aug. 15, 1952. 11p. (NYO-4026)

The fecal and urinary excretion of I^{131} was measured for 72 hours following the administration of a test meal containing I^{131}-labeled protein to patients with and without pancreatic insufficiency. Fecal excretion in the patients with pancreatic insufficiency was significantly greater than in patients with no disease of the gastrointestinal tract. Although the urinary excretion of isotope averaged significantly less in the patients with pancreatic insufficiency, the difference in urinary excretion in the 2 groups of patients was not as striking as with the fecal excretion values. The administration of pancreatic extract with the test meal decreased the fecal excretion and increased the urinary excretion of I^{131} in 3 out of 5 patients with pancreatic insufficiency. (auth)

6525

METHOD FOR DETERMINATION IN BIOLOGICAL MATERIAL OF TOTAL IRON AND OF THE ARTIFICIAL RADIOACTIVE ISOTOPE Fe^{55}. U. Salera and G. Tamburino. Arch. sci. biol. (Italy) 36, 297-307(1952) May-June. (In Italian)

The specific activity of Fe^{55} in any tissue can be determined by measuring the total Fe spectrophotometrically and the Fe^{55} with a G-M counter. The utilization of Fe by various organs and in different functions can thus be studied. Data on the total Fe content of the blood are presented.

CHEMISTRY

6526

Illinois Univ.

REPORT FOR THE PERIOD OCTOBER 21, 1951 TO SEPTEMBER 12, 1952 AND PROPOSAL FOR EXTENSION OF CONTRACT TO JANUARY 31, 1956 WITH PROPOSED PROGRAM AND BUDGET FOR THE PERIOD FEBRUARY 1, 1952 TO JANUARY 31, 1953. [nd] 161p. (AECU-2238)

Several schemes for the quantitative separation and estimation of millimole amounts of CO_2, CO, CH_4, HCOOH, HCN, HCHO, and CH_3OH were developed and tested. Irradiated samples of $NaNO_3$ and NH_4Cl were analyzed. The rate of exchange between labeled, uncomplexed carbonate-bicarbonate and carbonato-bisethylenediamine-cobalt(III) ion at ionic strength 0.2, temperature 25°C, and pH range 9 to 10 was studied. The isotopic exchange reaction between labeled CO_2 and solid $PbCO_3$ near 200°C was investigated. The C^{14} and C^{13} isotope effects in decarboxylation of malonic acid and bromomalonic acid were redetermined. The C^{13} effect in decarboxylation of malonic acid was measured as a function of decarboxylation temperature under conditions of homogeneous decomposition. A small C^{13} intramolecular effect was observed in the pyrolysis of Pb oxalate. The kinetics and mechanism of the decarboxylation of malonic acid and its half-anion were investigated as a function of the nature of amine-containing media.

6527

Argonne National Lab.

HYDROGEN ISOTOPE EFFECT IN THE HYDROLYSIS OF TRIPHENYLSILANE, by Louis Kaplan and Kenneth E. Wilzbach. Sept. 22, 1952. 5p. (AECU-2253; UAC-648)

The available information is not sufficient for an exact calculation of the ratio of the reaction rates but an approximate value may be obtained by assuming that the transmission coefficients for the isotopic reactions are identical, that the vibrations other than the stretching of the bonds involving the isotopic atoms may be neglected, that SiH and SiD stretching frequencies in the isotopic triphenylsilanes are the same as those in the corresponding tribromosilanes and that the H−H bonds in the transition states have the same frequencies as in the gaseous molecules.

6528

Washington Univ.

SOME OBSERVATIONS, INCLUDING PARAMAGNETIC RESONANCE STUDIES, ON A CLASS OF FREE RADICALS DERIVED FROM AROMATIC COMPOUNDS, by D. Lipkin, D. E. Paul, J. Townsend, and S. I. Weissman. [nd] 8p. (AECU-2263)

The intensely colored substances formed upon reaction of Na with naphthalene, anthracene, naphthacene, 1,2-benzanthracene, 20-methylcholanthrene, nitrobenzene, m-dinitrobenzene, 1,3,5-trinitrobenzene, or 2,3,7-trinitrofluorenone, in 1,2-dimethoxyethane or tetrahydrofuran as solvents, exhibit intense paramagnetic resonance absorptions. The reaction, using naphthalene as an example, may be represented by the equation: $Na + C_{10}H_8 \rightleftharpoons Na^+ + (C_{10}H_8)^-$. Equilibrium of the reaction, structure of the paramagnetic absorption spectra, and dependence of the latter on the particular free radical and its concentration are discussed. Formation of a negative hydrocarbon free radical is indicated as the mechanism of Na catalysis of polymerization. Carcinogenic activity of certain hydrocarbons may be due to their ability to form negative free radicals with mild reducing agents.

6529

Institute for the Study of Rate Processes, Univ. of Utah
STUDIES OF PHOTOSYNTHETIC PROCESSES. THE KINETICS OF OXIDATION REDUCTION REACTIONS IN SOLUTION, by Rudolph J. Marcus, Bruno J. Zwolinski, Henry Eyring, and John D. Spikes. July 1, 1952. 19p. (AECU-2271; Technical Report No. 5)

Because the photosynthetic reaction is such a complex one, it is necessary to study first the mechanism of simple oxidation-reduction reactions in solution. The pertinent theories on this latter subject are summarized, and the available experimental data are collected. Transmission coefficients for electron tunneling through potential barriers and barrier widths are calculated for numerous reactions of Co, Tl, Sn, Sb, Fe, U, Ce, V, Np, and Cu ions and complexes. Approaches to the problem of electron transfer in chlorophyll are pointed out.

6530

Brookhaven National Lab.
QUINONE-HYDROQUINONE EXCHANGE REACTIONS. II. DUROQUINONE AND DUROHYDROQUINONE EXCHANGE IN BUFFERED METHANOL SOLUTION, by Aksel A. Bothner-By. [nd] 15p. (BNL-1256)

A study has been made of the electron exchange reaction at 25°C between duroquinone and durohydroquinone-α-C^{14} dissolved in methanol saturated with potassium biphthallate. The exchange reaction proceeds at a measurable rate with a half life in the order of minutes. In the range of concentrations studied, the rate of reaction is approximately independent of the quinone concentration and first-order with respect to the hydroquinone. (auth)

6531

Laboratory for Nuclear Science, Mass. Inst. of Tech.
NUCLEAR CHEMISTRY (INORGANIC) GROUP and NUCLEAR CHEMISTRY (ORGANIC) GROUP, p.28-50 of TWENTY SIXTH PROGRESS REPORT FOR PERIOD MAY 31, 1952 TO AUGUST 31, 1952. Aug. 31, 1952. 23p. (NP-4119(p.28-50))

The solubility of TeO_2 in HCl and perchloric acid was investigated, and the solubility constant and equilibrium constant for addition of the first Cl are given. Dimerization of Te chloride complexes in HCl and $(ClCH_2CH_2)_2O$ is discussed. Extraction of $GeCl_4$–HCl into $(ClCH_2CH_2)_2O$, $CHCl_3$, CCl_4, and C_6H_6 is described. An apparatus for ion separations on a rotating-membrane belt is described. A quantitative investigation of Mo^{101} and Tc^{101} in fission and of photofission of U was made. Relative (γ,n), (γ,p), and (γ,pn) cross sections in Te^{128} and Te^{130} are reported, and isomerism in 40-m Cd^{117m} and a search for In^{117m} are discussed. Parameters for predicting β-decay energies are given. Carbonium ion rearrangements are described.

6532

Carnegie Inst. of Tech.
GRAIN BOUNDARY DIFFUSION OF ZINC IN COPPER, by R. Flanagan and R. Smoluchowski. Feb. 15, 1952. 10p. (NYO-3182)

In continuation of a previous study of grain boundary diffusion of silver in copper the grain boundary diffusion of zinc along grain boundaries of columnar copper has been investigated at various temperatures. The results confirm the influence of the angle between the grains on diffusion and indicate an angular dependence of the activation energy. The latter reaches very small or even negative values in a certain range of orientation in agreement with the proposed model. (auth)

6533

Pennsylvania State Coll. School of Chemistry and Physics
STABILITY CONSTANTS OF METAL DERIVATIVES OF o,o′-DIHYDROXYAZO DYES, by Fred A. Snavely, W. Conard Fernelius, and Bodie E. Douglas. June 13, 1952. 21p. (NYO-3375)

The relative stabilities of metal derivatives of o,o′-dihydroxyazo dyes (terdentate groups) have been measured potentiometrically in 75/25 volume per cent dioxane-water. The order of stability of the metal derivatives agrees with those already reported in the literature for unidentate and bidentate groups. One o-hydroxy-o′-carboxy azo dye is included as it shows steric differences and coordinates with beryllium. The impossibility of previously suggested structures of metal-dye derivatives is discussed. A dependency of coordination power on the acid dissociation constant of the chelating agent is shown. (auth)

6534

Pennsylvania State Coll. School of Chemistry and Physics
FORMATION CONSTANTS OF METAL COMPLEXES OF TROPOLONE AND ITS DERIVATIVES: I. TROPOLONE. II. SIMPLE SUBSTITUTION PRODUCTS OF TROPOLONE, by Burl E. Bryant, W. Conard Fernelius, and Bodie E. Douglas. June 11, 1952. 31p. (NYO-3376)

Formation constants of eight metal-tropolone complexes have been measured in 50% water-dioxane solution. It has been found that the Cu complex is more stable than the Cu complexes of β-diketones of comparable acidity. A list of insoluble complexes is given. The order of stability for the metals is the same as that found for other types of coordinating agents. Zn, Ni, and Co(II) coordinate three molecules of tropolone, whereas Cu(II), Pb, Be, Mg, and Ca coordinate only two tropolone molecules to form a neutral inner complex. The acid dissociation constants in 50% water-dioxane at 30°C have been determined for α-methyl-, β-methyl-, α-isopropyl-, β-isopropyl-, and α-bromotropolone. The formation constants of several divalent metal derivatives of these also have been determined. (auth)

6535

Pittsburgh Univ.
STRUCTURE AND BEHAVIOR OF ORGANIC CHELATING AGENTS OF ANALYTICAL SIGNIFICANCE. V. DIMETHYLGLYOXIME AND ITS OXYGEN MONOMETHYL ETHER, by Robert G. Charles and Henry Freiser. Issued Sept. 16, 1952. 20p. (NYO-3769)

The Calvin-Bjerrum titration technique for the determination of chelate formation constants has been applied to the study of some divalent and trivalent metallic chelates of dimethylglyoxime and its O-monomethyl ether. The results indicate that the famed specificity of dimethylglyoxime for nickel does not lie in any special stability of the chelate but in some other factor, possibly solubility. The differences in solubility of the copper and nickel dimethylglyoxime complexes might be due to the possibility of a higher degree of hydration in the former complex. A comparison of the chelates of dimethylglyoxime and those of its O-ether are discussed in the light of such structural factors as hydrogen bonding and steric hindrance. (auth)

6536

Radiation Lab., Univ. of Calif., Berkeley
SUMMARY OF THE RESEARCH PROGRESS MEETING OF JULY 24, 1952, by Sergey Shewchuck. Aug. 21, 1952. 7p. (UCRL-1915)

A brief summary by M. Calvin of the information in report UCRL-1861, "Studies in Photosynthesis With Isotopes," is presented.

6537

REACTION OF TANTALUM WITH HYDROGEN CHLORIDE, HYDROGEN BROMIDE AND TANTALUM PENTACHLORIDE; ACTION OF HYDROGEN ON TANTALUM PENTACHLORIDE. Ralph C. Young and Carl H. Brubacker, Jr. J. Am. Chem. Soc. 74, 4967(1952) Oct. 5.

When HCl gas was passed over Ta metal at 410°C and above, white $TaCl_5$ formed and collected on a cold-finger condenser. When the temperature was elevated to 600 to 750°C, a thin film of metal, containing dissolved H_2, formed on the heated tube walls. After the reaction proceeded (600 to 750°C) for a few hours, it slowed markedly and an olive-colored powder ($TaCl_2$) formed on the surface of the unreacted metal. The $TaCl_2$ powder (mixed with metal) was treated with 1M KOH, and the residual Ta was filtered away. When the solution was heated, H_2 bubbled off, and a dark flocculent precipitate (presumably $TaO_2.xH_2O$) formed. The metallic Ta films were fused with Na_2CO_3. During the fusion considerable adsorbed H_2 gas escaped. When HBr was passed over metallic Ta at 375°C, $TaBr_5$ formed, and, if the temperature was maintained at 550°C or above, some tribromide began to form apparently mixed with a still lower bromide or perhaps the metal. At higher temperatures (up to 800°C) Ta metal deposited in the apparatus, probably as the result of reduction or thermal decomposition of the penta- or tribromide. This reaction was also slowed by the formation of a green powder ($TaBr_3$) on the surface of the unreacted metal. $TaCl_5$ was not reduced by the metal at 350 to 400°C in an evacuated tube. In the range 475 to 500°C, however, a small amount of a green chloride formed. The presence of some Ta in a lower oxidation state (probably III) and possibly a compound such as Ta_3Cl_{10} is indicated. $TaCl_5$ was not reduced by H_2 at temperatures up to 400°C. However, if the reaction was carried out at 500°C, some reduction of the pentachloride did occur, and a film of the product, Ta metal, containing dissolved H_2, deposited on the heated walls of the reduction tube. No lower chlorides could be detected.

ANALYTICAL PROCEDURES

6538
Hanford Works
ZIRCONIUM ANALYSIS, by R. C. Thorburn. Feb. 21, 1950. 5p. Decl. with deletions Oct. 16, 1952. (AECD-3451; HW-17005)

Separation of zirconium from the urine salts by standard chemical methods was tried with poor results. A clean separation was obtained by precipitating zirconium in a strong acid solution of the salts with phosphate ion. The zirconium is then dissolved by complexing with fluoride ion and the other acid insoluble salts are removed by centrifugation. The zirconium fluoride or zirconyl fluoride complex is then destroyed by adding an excess of boron, allowing the zirconium to be reprecipitated as the phosphate. After two of these cycles, the zirconium phosphate is ignited to the pyrophosphate and weighed as such. Acceptable yields were obtained; the method is rapid and adaptable to routine analyses. (auth)

6539
Brookhaven National Lab.
DETERMINATION OF CHOLESTEROL DIGITONIDE WITH ANTHRONE, by L. F. Nims and Elizabeth Sutton. [nd] 10p. (BNL-1264)

A new colorimetric method for the determination of cholesterol has been investigated. It makes use of the relatively stable green color given by a purified digitonin precipitate with the anthrone reagent of Dreywood. Equal precision can be obtained with the new method using 1/10 or less of the quantity of material required for present colorimetric methods. (auth)

6540
Walker Lab., Rensselaer Polytechnic Inst.
DETERMINATION OF WATER BY KAPL FISCHER TITRATION IN THE PRESENCE OF FERRIC SALTS, by Anders H. Laurene. [nd] 3p. (NYO-615)

Ferric salts interfere in the determination of water by titration with Karl Fischer reagent. This interference is caused by reduction of the metal ion by the reagent with simultaneous liberation of iodine. It has been found that reduction of the ferric ion may be eliminated by complexing it with 8-hydroxyquinoline. This method has been applied to the determination of water in ethereal and alcoholic solutions of ferric salts. The results from some determinations are tabulated.

6541
Princeton Univ.
SPECTROPHOTOMETRIC TITRATION OF URANIUM AND IRON, by Clark E. Bricker and Philip B. Sweetser. [nd] 16p. (NYO-3611)

Spectrophotometric titrations have been shown recently to be extremely sensitive and accurate in a wide variety of applications. The use of this method for detecting the endpoint in determinations of U and Fe when present separately or in mixtures with ceric sulfate has not been studied previously. Procedures which involve the reduction of the U and/or Fe solutions with a 90% Cd amalgam reductor followed by titration with a standard ceric sulfate solution are given. The acid concentration, the composition of the Cd reductor, the rate of the oxidation between U(IV) and Fe(III), and the effect of induced air oxidation of U(IV) in the presence of Fe(II) ions were studied. Milligram quantities of U and Fe individually can be determined in a volume of 90 to 100 ml with an accuracy of about 3 parts per thousand. With mixtures of these two ions, the accuracy of the Fe titration is about 8 parts per thousand whereas that of the U determination is about 6 parts per thousand. These titrations are rapid and accurate, require no modification of a spectrophotometer, and utilize very little special equipment. (auth)

6542
Sedgwick Labs. of Sanitary Science, Mass. Inst. of Tech.
APPLICATION OF DROPPING MERCURY ELECTRODE TO B.O.D. DETERMINATIONS, by Arthur W. Busch and Clair N. Sawyer. May 27, 1952. 55p. (NYO-4436)

The biochemical oxygen demand (B.O.D.) determination, when performed using the Winkler method for measuring dissolved O (D.O.) is a laborious and time-consuming procedure and is hazardous with radioactive samples. Results of an extensive investigation of the use of the dropping mercury electrode (polarograph) for D.O. measurements in B.O.D. studies as a possible method of eliminating contamination hazards are reported. A single-potential technique, treating the residual current as an inherent characteristic of the method, was found to be satisfactory for the determination of residual D.O. after 5 days incubation. Analysis of a large number of replicate samples of a diluted synthetic sewage, known to contain no substances interfering with the Winkler test, by both the polarographic and Winkler methods permitted a statistical comparison of the precision and accuracy of the two methods. The polarographic method of measuring D.O. had standard deviations of 0.068 and 0.094 ppm at 0 and 5 days incubation, and the Winkler method had standard deviations of 0.047 and 0.0117 ppm. Subsequent investigations were conducted with sewage and a variety of industrial wastes to determine the efficacy of the polarograph in B.O.D. studies involving such substrates. The feasibility of using a single calibration curve for samples incubated for 5 days was investigated. Results indicate the use of the polarograph in B.O.D. studies to be practical for research purposes and for routine analyses of a large number of samples.

6543
GRAVIMETRIC DETERMINATION OF THORIUM AND RARE EARTH ELEMENTS IN MAGNESIUM ALLOYS. G. B. Wengert, R. C. Walker, M. F. Loucks, and V. A. Stenger. Anal. Chem. 24, 1636-8(1952) Oct.

The probable presence of Zr and Zn as alloying agents and traces of Fe, Cu, Pb, Mn, and Al as impurities complicates the analysis of high-temperature Mg alloys for Th and the rare earths. In the proposed procedure, benzoic acid and ammonium sebacate are used to bring about preliminary separations. Final determinations are by the oxalate method with ignition to the oxides.

6544

RAPID SPECTROSCOPIC DETERMINATION OF TOTAL WATER CONTENT. Harold J. Morowitz and Herbert P. Broida. Anal. Chem. 24, 1657-8(1952) Oct.

The application of an isotopic dilution technique has yielded a satisfactory method for determining total water content of materials to within 3%. Results of preliminary studies with known hydrated crystals are presented to demonstrate the utility of the method, which consists in dissolving a known amount of the hydrated compound to be assayed in a known quantity of a mixture of D_2O and H_2O. The ratio of H_2O is measured in the solvent both before the hydrate is added and after equilibrium has taken place. The difference in these ratios is due to the water content of the hydrate which may be assumed to be entirely H_2O. The rapidity of the method has been achieved by the use of spectroscopic methods with photoelectric recording. An entire analysis can be done in less than 0.5 hr.

6545

DETERMINATION OF TITANIUM IN TITANIUM METAL. J. M. Thompson. Anal. Chem. 24, 1632-4(1952) Oct.

A method is described for the determination of Ti in high-purity Ti metal based on the work of Knecht and Hibbert (Ber. 36, 1549(1903)), who employed a standard solution of ferric salt for titrimetric estimation of Ti. Modification includes the use of thiocyanate added directly to the test solution instead of its employment as an outside indicator. Interfering elements are not normally present. Cr, Mo, W, and V may be present in some alloys and must be removed. A method for removal is outlined.

6546

DETERMINATION OF MICROGRAM QUANTITIES OF THORIUM IN WATER. EXTENSION OF COLORIMETRIC METHOD. Albert E. Taylor and Richard T. Dillon. Anal. Chem. 24, 1624-5(1952) Oct.

A method is described for concentrating the Th present in water, so that it can be determined spectrophotometrically. The thorium is concentrated by precipitation of Th oxalate with Ca as a carrier under controlled conditions of pH, conversion of the oxalate to carbonate by heating, and dissolution of the resulting carbonates in HCl. The determination utilizes the disodium salt of 1-(o-arsonophenylazo)-2-naphthol-3,6-disulfonic acid to form a colored complex with Th. The method is sensitive to less than 1×10^{-9} g of Th in 1 g of water with an average error of approximately 1×10^{-10} g of Th per gram of water.

6547

DETERMINATION OF FLUORIDE IN WATER BY THE ALUMINUM-HEMOTOXYLIN METHOD. Margaret J. Price and Osman J. Walker. Anal. Chem. 24, 1593-5(1952) Oct.

There is need for a rapid photometric method, accurate to 0.1 ppm, for the determination of fluoride in natural and fluoridated water. The factors that make use of the bleaching effect of fluoride on the Al-hematoxylin lake as a photoelectric colorimetric method for fluoride in water have been studied. This method allows the determination of 0 to 1.5 ppm of fluoride ion with an accuracy of 0.05 ppm if recrystallized hematoxylin, which has been oxidized with H_2O_2, is used at a pH of 4.6. Satisfactory color development occurs within 4 hr. With higher concentrations of fluoride smaller samples are taken and diluted to the proper volume with distilled water. Sulfates and, to a lesser extent, phosphates interfere in this method, but have less effect than on other colorimetric and photometric methods. This method can be carried out accurately and quickly on water samples, if sulfates and phosphates are determined and corrections applied when necessary. (auth)

6548

SPECTROPHOTOMETRIC METHOD FOR DETERMINATION OF THE FLUORIDE ION. H. E. Bumsted and J. C. Wells. Anal. Chem. 24, 1595-7(1952) Oct.

The purpose of this study was the development of a suitable reagent for the spectrophotometric determination of microgram quantities of the fluoride ion. The usual reagents gave colors too faint for good spectrophotometric measurements. A modified Zr-alizarin reagent was developed which will produce colors intense enough to be read by the spectrophotometer in the range from 0 to 4 μg of fluoride/ml of sample. Concentrations as low as 0.1 μg/ml can be satisfactorily determined. This method provides for precise measurement of the bleaching effect of the fluoride ion on the Zr-alizarin lake and eliminates variations due to different analysts reading Nessler tubes or titration end points. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

6549

Institute of Atomic Research, Iowa State Coll.

THE STRUCTURE OF NICKEL DIMETHYLGLYOXIME, by L. Edward Godycki and R. E. Rundle. [nd] 24p. [ISC-272)

Nickel-dimethylglyoxime is orthorhombic, $a_0 = 16.68$, $b_0 = 10.44$, $c_0 = 6.49$ A, Z = 4, space group Ibam. The molecules are required to have symmetry 2/m, and within our limits of error, have the higher symmetry, m m m. The expected structure, with only nitrogens bonded to nickel, and five-membered rings, is confirmed. The intramolecular O–H–O bonds are the shortest yet observed, 2.44 A. An explanation is advanced to explain the difference in solubilities of copper and nickel dimethylglyoximes in water, and the unusually small pleochroism. Crystallographic data are given for the corresponding palladium compound, and for nickel cyclohexanedionedioxime. (auth)

6550

New Jersey Zinc Co. (of Pa.)

FINAL TECHNICAL REPORT [ON] RESEARCH AND DEVELOPMENT ON PLASTIC DEFORMATION AND DIRECTIONAL PROPERTIES OF TITANIUM, by E. A. Anderson and D. C. Jillson. Aug. 15, 1952. 128p. (NP-4072; WAL-401/78-12)

Alpha titanium crystals of sufficient size for plastic deformation studies were produced by repeated cycling in vacuo between four hours at 1200°C and three to five days at 850°C. Deformation studies showed that slip can occur in alpha titanium at a critical resolved shear stress of about 5000 g/mm² on the $\{10\bar{1}0\}$ planes or about 11,000 g/mm² on the (0002) plane, in both cases in the close-packed direction. Twinning can take place on the $\{11\bar{2}1\}$, $\{11\bar{2}2\}$, and $\{10\bar{1}2\}$ planes. The recrystallization temperature of cold rolled iodide titanium is about 475°C for conditions of fairly slow heating and one hour at temperature. The recrystallization temperature is virtually independent of amount of cold reduction between 30 and 96.5%. Grain size is independent of per cent reduction in this range and dependent upon temperature. The recrystallization curves show unexplained anomalies. Cold rolling tends to produce a $\{11\bar{2}4\}\langle 10\bar{1}0\rangle$ texture while subsequent annealing tends to produce a $\{20\bar{2}5\}\langle 11\bar{2}0\rangle$ texture. Both require the largest cold reduction or the highest alpha temperature anneal to be developed sharply. Lower reductions or annealing temperatures result in mixtures of the two textures. Recrystallization without extensive grain

growth results in a mixture of the two textures. Increase in temperature results in growth of the grains of the {20$\bar{2}$5} <11$\bar{2}$0> texture at the expense of the others. (auth)

DEUTERIUM AND DEUTERIUM COMPOUNDS

6551
Georgia Inst. of Tech.
THE RATE OF DEUTERIUM EXCHANGE BETWEEN ETHANOL AND WATER. A REINVESTIGATION, by Jack Hine and Cyrus H. Thomas. [nd] 5p. (AECU-2261)

W. J. C. Orr (Trans. Faraday Soc. 32, 1033(1936)) reported that the establishment of equilibrium between ethanol and water is a reaction of measurable rate. Other workers, however, found that the equilibrium is established too rapidly to measure. Since the validity of the widely held belief that all proton reactions between oxygen atoms occur too rapidly to measure by conventional means is of considerable importance, another check of Orr's work, using his method for separating C_2H_5OH and D_2O, was made. It was found that the prototropic equilibrium between water and the hydroxy group of ethanol is established too rapidly to measure under the experimental conditions.

6552
National Bureau of Standards
A REVIEW OF THE PROPERTIES OF DEUTERIUM COMPOUNDS; ANNUAL BIBLIOGRAPHY—1950, by Lawrence M. Brown, Jack M. Goldstein, John J. Park, and Charles W. Beckett. Sept. 1, 1952. 112p. (NBS-1777)

A bibliography of published research on the isotopes of hydrogen and their compounds has been compiled from Chemical Abstracts, British Abstracts and Physics Abstracts for the year 1950. Each entry in the bibliography is listed alphabetically according to its leading author and contains, in addition to its title and literature reference, a subject code symbol designating its content. The bibliography is supplemented by both a compound and a subject index. The arrangement of the bibliography parallels that of a similar bibliography compiled by Kimball for the period 1932 to 1945, inclusive. (auth)

FLUORINE AND FLUORINE COMPOUNDS

6553
National Bureau of Standards
THERMAL PROPERTIES OF FLUORINE COMPOUNDS: HEAT CAPACITY, ENTROPY, HEAT CONTENT AND FREE ENERGY FUNCTIONS OF BERYLLIUM MONOFLUORIDE IN THE IDEAL GASEOUS STATE, by Lester Haar and Charles W. Beckett. Sept. 15, 1952. 6p. (NBS-1647)

Ideal gas thermal functions for BeF are calculated from spectroscopic data. Heat capacity, entropy, heat content and free energy functions are tabulated in dimensionless units at closely spaced temperature intervals from 50 to 5000°K. (auth

6554
Cryogenic Lab., Ohio State Univ.
THE HEAT CAPACITY, HEAT OF FUSION AND HEAT OF VAPORIZATION OF HYDROGEN FLUORIDE; TECHNICAL REPORT, by Jih-Heng Hu, David White, and H. L. Johnston. July 8, 1952. 19p. (NP-4043; TR 283-19; U23918)

The heat capacities of 99.8% pure solid and liquid HF were measured between 15 and 300°K. The absence of second-order transitions in the solid state was attributed to the H bonding in HF. The heat of fusion at the m.p. (189.79 ± 0.02°K) was 46.93 ± 0.04 cal/g. The heat of vaporization at 741.4 mm and 292.61 ± 0.1°K was 89.45 ± 0.20 cal/g. A comparison of the molar entropy (23.90 E.U.) at 741.4 mm and 292.61°K, calculated from heat-capacity data and the third law, with that of the spectroscopic value showed a difference of 17.53 E.U. The discrepancy was accounted for by assuming that the gas was an equilibrium mixture of the monomer, dimer, trimer, and higher polymers produced by H bonding. (cf. TIP U21185) (NRS abst.)

6555
Bureau of Mines
BIBLIOGRAPHY ON THE DETERMINATION OF FLUORINE AND FLUORIDE ION; SYNTHETIC FUELS RESEARCH BRANCH BIMONTHLY REPORT FOR PERIOD ENDING FEBRUARY 12, 1952, by Elaine G. Aiken. Feb. 26, 1952. 9p. (NP-4126)

This bibliography includes, for the most part, only those methods which appeared to be amenable to field use for the detection and determination of F and F^- contamination in the atmosphere. The information was obtained primarily from Chemical Abstracts from 1937 to 1951, inclusive. Other references were obtained from the bibliographies prepared by F. E. McKenna and published in Nucleonics 8, No. 6, 24(1951); 9, No. 1, 40(1951); and 9, No. 2, 51(1951). The first part of the bibliography reviews the literature on the determination of F^- by visual detection methods, colorimetric or titrametric methods, and miscellaneous methods. The second part reviews determination procedures for F. The third part reviews F chemistry and collections of F^- fumes in air. The fourth part lists several bibliographies on F and F^- determination.

6556
New York Univ.
THE ENTROPY OF FLUORINE, by George M. Murphy and E. Rubin. May 12, 1952. 5p. (NYO-3504)

This material appeared in J. Chem. Phys. 20, 1179-80 (1952) and was abstracted in Nuclear Science Abstracts as NSA 6-5331.

6557
Washington Square Coll. of Arts and Sciences, New York Univ.
THERMODYNAMIC CALCULATIONS ON SOME EQULIBRIA BETWEEN ALKALINE EARTH FLUORIDES AND HYDROGEN FLUORIDE, by George M. Murphy and Ephraim L. Rubin. July 24, 1952. 21p. (NYO-3505)

The possibility of preparing HF from a salt, such as MgF_2, by some method that could compete with the H_2SO_4 reaction usually used has been studied by thermodynamic calculations. After a review of general methods for preparing the hydrogen halides, nine heterogeneous gas-solid or liquid-solid phase reactions were investigated. The salt in each case was RF_2, where R = Mg, Ca, Sr, or Ba. In no case were the free energy changes favorable for the process proposed. It is suggested that some reactions in solution might be more suitable. In particular, the reaction between HCl and MgF_2 might be investigated. The HF formed by the reaction would be recovered as the constant-boiling mixture containing about 36% HF and boiling at 120°C.

6558
THE PROPERTIES OF n-BUTFORANE AND ITS MIXTURES WITH n-BUTANE. J. H. Simons and J. W. Mausteller. J. Chem. Phys. 20, 1516-19(1952) Oct.

The physical properties of n-butforane, C_4F_{10}, were determined and also these mixtures of it with n-butane, C_4H_{10}. The properties of these two-component systems parallel very closely the system previously reported, n-pentforane and n-pentane. The necessity of a concept such as that of "interpenetration" is confirmed. (auth)

6559
THE CHLORINATION OF 1,1-DIFLUOROETHANE AND 1-CHLORO-1,1-DIFLUOROETHANE. John T. Barr, J. Donald Gibson, and R. H. Lafferty, Jr. J. Am. Chem. Soc. 74, 4945-6(1952) Oct. 5.

Thermal chlorination of 1-chloro-1,1-difluoroethane was

attempted in iron, stainless steel, monel, Ni, and Cu reactors. At temperatures below 400°C, no appreciable reaction occurred in Cu and Ni reactors. Extensive dehydrofluorination was found to occur in iron reactors at 200 to 400°C, and the over-all reaction was that of the chlorination of 1-chloro-1,1-difluoroethane and its dehydrofluorination products, with the latter predominating. The effect of the iron concentration in the reactor metal was profound. At 300°C about 60% of the original F was in the products obtained with the monel reactor, about 20% in those from the stainless steel, and only 10% in those from the iron reactor. No evidence of dehydrofluorination was found during the photochemical chlorination of 1,1-difluoroethane at temperatures below 200°C, and the reaction gave the expected products.

6560

INFRARED AND RAMAN SPECTROSCOPY STUDIES OF LIGHT AND HEAVY TRIFLUOROACETIC ACIDS. Nelson Fuson, Marie-Louise Josien, Ernest A. Jones, and James R. Lawson. J. Chem. Phys. 20, 1627-34(1592) Oct.

An infrared and Raman spectroscopic study of light and heavy trifluoroacetic acids shows that their vapors at room temperature are composed of a mixture of monomeric and associated molecules. The principal bands corresponding to vibrations of the COOH and COOD groups have been identified for both the monomeric and the associated molecules by means of a comparative study of the two acids (a) in the vapor state at different pressures, (b) in CCl_4 solutions at various concentrations, and (c) in the liquid state. The monomeric carbonyl frequencies, influenced by the presence of the perfluoromethyl group, are the highest yet reported in the literature; this is true not only for CF_3COOH (1826 cm^{-1}, vapor), CF_3COOD (1823 cm^{-1}, vapor), but also for the ethyl ester, $CF_3COOC_2H_5$ (1802 cm^{-1}, vapor), the sodium salt, CF_3COONa (1687 cm^{-1}, solid), and the anhydride $(CF_3CO)_2O$ (1884 cm^{-1} and 1818 cm^{-1}, vapor). On the basis of a comparative study of the spectra of all these compounds, as well as of other perfluoromethyl compound spectra reported in the literature, the C–F stretching vibrations for the two acids have been assigned to the strong infrared absorptions at 1244 cm^{-1} and 1185 cm^{-1}. The corresponding Raman bands are very weak. (auth)

LABORATORIES AND EQUIPMENT

6561

Atomic Energy Research Establishment, Harwell, Berks (England)

A SIMPLE AIR PULSED AGITATOR UNIT, by K. W. Bagnall and G. L. Miles. June 17, 1952. 4p. (AERE C/M-151)

A simple air pulsed agitator unit is described which is suitable for stirring active liquids in dry-boxes and is particularly useful for small-scale batch solvent extraction equipment. (auth)

6562

Air Cleaning Lab., Harvard Univ. School of Public Health

PARTICLE SIZE EFFICIENCY STUDIES ON A DESIGN 2 AEROTEC TUBE, by Richard Dennis, Richard Coleman, Leslie Silverman, and M. W. First. Apr. 1, 1952. 12p. (NYO-1583)

The purpose of this study was to determine whether the use of a Design 2 Aerotec tube upstream of a Hi-Volume sampler would permit an approximate separation of respirable and irrespirable dusts, i.e., separation of particles greater than 5 μ from those less than 5 μ. The results of a series of tests with aluminum oxide, silica, and iron dust while operating the Aerotec unit at 20, 30 and 40 cfm indicated collection efficiencies of approximately 100% for particle diameters greater than 8 μ regardless of variations in specific gravity (2.65 to 7.86) and operating volume (20 to 40 cfm). At constant capacity and with any one test dust, collection efficiencies for particles less than 8 μ in diameter showed a gradual reduction as the particle diameter decreased. The retention of particles less than 8 μ varied directly with particle specific gravity and air flow rate. (auth)

6563

Air Cleaning Lab., Harvard Univ. School of Public Health

EFFICIENCY STUDIES OF FIBERGLAS PREFILTERS FOR CHEMICAL AND LABORATORY HOODS (Argonne National Laboratory Type), by Leslie Silverman, Melvin W. First, and Philip La Torre. June 6, 1952. 17p. (NYO-1584)

An evaluation was made of three types of chemical hood filters composed of ½-in.-thick preformed resin-bonded glass fiber batts, pleated into 16 × 20 × 2-in. steel frames. On the basis of the National Bureau of Standards discoloration tests, using atmospheric dust, and the American Society of Heating and Ventilating Engineers weight efficiency tests, it was concluded that the three different designs were equivalent in retention and in air flow resistance. (auth)

MOLECULAR STRUCTURE

6564

ELECTRON DISTRIBUTION IN MOLECULES. I. F^{19} NUCLEAR MAGNETIC SHIELDING AND SUBSTITUENT EFFECTS IN SOME BENZENE DERIVATIVES. H. S. Gutowsky, D. W. McCall, B. R. McGarvey, and L. H. Meyer. J. Am. Chem. Soc. 74, 4809-17(1952) Oct. 5.

The influence of substituents on the electron distribution in benzene produces changes in the nuclear magnetic shielding of F atoms in the molecule. A comparison of the F^{19} nuclear magnetic shielding in fluorobenzene with that in a substituted fluorobenzene is used in defining a δ-parameter. Experimental δ-values are reported for a considerable number of mono- and polysubstituted fluorobenzenes. An empirical correlation of δ-values for meta and para substituents with the corresponding Hammett substituent σ-constants reveals systematic differences which are attributed to the dependence of the δ-values on the nature of the electronic interactions of the substituent. Thereby, a detailed analysis of the δ- and σ-values for particular substituents permits evaluation of the nature of their electronic effects. Consideration of ortho substituents suggests that besides the usual inductive and electromeric effects at the meta and para positions, an additional interaction contributes to the δ_o-values in some cases. The potential uses and limitations of δ_o-values in evaluating ortho-effects and entropies of reaction are discussed. It is concluded from δ-values for polysubstituted fluorobenzenes that the electronic effects of substituents are usually remarkably additive but with significant non-additivity demonstrating interactions between substituents in about a third of the compounds investigated. A δ′-parameter, analogous to δ, is defined in terms of the change produced by a substituent in the ring on the F^{19} nuclear magnetic shielding in benzotrifluorides. The δ′-values are about a tenth of the δ-values for the same substituent, indicating the extent of attenuation in the side chain of the substituent effects. Less conclusive discussions and comparisons are given of various other aspects of the data and experimental method. (auth)

RADIATION CHEMISTRY

6565

Argonne National Lab.

FREE RADICAL INITIATED $O^{16}O^{18}$–H_2O^{16} EXCHANGE REACTION IN AQUEOUS SOLUTIONS, by Edwin J. Hart, Dwight A. Hutchison and Sheffield Gordon. Aug. 1952. 3p. (AECU-2234; UAC-625)

A gamma-ray-initiated chain conversion of isotopically

enriched dissolved oxygen (O_2^*) to normal dissolved oxygen has been found in alkaline solutions. The yield of this reaction increases with pH and concentration of O_2^* and is inhibited by hydrogen peroxide. The yield appears to be independent of dosage rate in the range from 2.19×10^{20} to 0.464×10^{20} ev per liter per minute. The initial yields of normal oxygen from the enriched oxygen is tabulated.

6566
REACTIONS OF METHANE WITH IODINE ACTIVATED BY RADIATIVE NEUTRON CAPTURE. J. F. Hornig, G. Levey, and J. E. Willard. J. Chem. Phys. 20, 1556-60(1952) Oct.

About 50 percent of the I^{128} atoms formed by the $I^{127}(n,\gamma)I^{128}$ reaction in gaseous mixtures of 0.2 mm of iodine and 400 mm of methane enter combination as methyl iodide, whereas much less than 1 percent of iodine atoms produced simultaneously by the photochemical dissociation of the iodine do so. By contrast, about 1 percent of the I^{128} formed by the $I^{127}(n,\gamma)I^{128}$ reaction in gaseous mixtures of iodine and ethyl iodide enters organic combination. The solubility of iodine in pure liquid methane is less than 10^{-10} mole/liter but as much as 3×10^{-5} mole/liter may be dissolved when air has been allowed to condense in the methane. In such solutions I^{128} from the $I^{127}(n,\gamma)I^{128}$ reaction is able to enter organic combination as methyl iodide, ethyl iodide, and higher boiling material. (auth)

6567
THE RADIATION DECOMPOSITION OF ORGANIC MOLECULES. J. B. Birks. J. Chem. Phys. 20, 1655-6(1952) Oct.

Alder and Eyring (Nucleonics 10, No. 4, 54(1952)) proposed a general mechanism to account for the behavior of aqueous solutions involving interactions between H, OH, and HO_2 radicals and the solute molecules. This note proposes an alternative, simpler mechanism of radiation decomposition in terms of primary photon emission by the molecules ionized and excited by the ionizing radiation.

RADIATION EFFECTS

6568
RADIOCHEMICAL OXIDATION OF FERROUS SULFATE IN PRESENCE OF HYDROCARBONS AND ALCOHOLS. Maurice Cottin, Moise Haissinsky, and Catherine Vermeil. Compt. rend. 235, 542-4(1952) Sept. 8. (In French)

Dilute (5×10^{-3} M and 5×10^{-4} M) acid solutions of $(NH_4)_2Fe(SO_4)_2$ containing small quantities of n-butanol, n-pentanol, n-heptanol, n-octanol, or cyclohexanol were x-irradiated. The number of Fe^{++} ions oxidized is plotted as a function of absorbed radiation. As with hydrocarbons, the initial increase in yield is followed by a rapid decrease. The variation in yield increases with the decrease in molecular weight of the alcohol, the effect of cyclohexanol is more marked than the effects of aliphatic alcohols, and the oxidizable quantity of Fe tends to a limit, which decreases with the molecular weight of the alcohol.

6569
FORMATION AND DECOMPOSITION OF HYDROGEN PEROXIDE IN WATER IRRADIATED WITH POLONIUM α PARTICLES. Mario do Carmo Anta and Mol'se Haĭssinsky. Compt rend. 235, 170-2(1952) July 16. (In French)

A Po salt was dissolved in aqueous H_2SO_4, $HClO_4$, or HNO_3, each 0.8N, to give activities of 0.16, 0.6, or 0.7 mc/cm^3. Formation of H_2O_2, or decomposition of added excess H_2O_2, was followed for several weeks by cerimetry. Limiting concentrations of H_2O_2, depending on the radiation level, were indicated in H_2SO_4 and $HClO_4$. H_2O_2 did not form in HNO_3, and added H_2O_2 decomposed with an initial ionic yield G of 1.6 molecules/100 ev. Po exposure results in quite different radiochemical behavior of H_2O and H_2O_2 from that caused by Rn.

RARE EARTHS AND RARE-EARTH COMPOUNDS

6570
Argonne National Lab.
ELECTROCHROMATOGRAPHIC SEPARATION OF RARE EARTHS, by Takuya R. Sato, Herbert Diamond, William P. Norris, and Harold H. Strain. Sept. 1952. 4p. (AECU-2256; UAC-642)

For one-way, discontinuous differential electrical migrations, filter paper 3 to 6 ft by 20 in. was moistened with the electrolytic solution. About 50 μl of the carrier-free mixtures (about 0.3 μc per component) and separate reference zones of the components were added near the center. The paper was encased in a polyethylene sheet, and the ends were dipped into separate portions of the electrolytic solutions (8 liters). After electrolysis (5 v/cm, 1 to 2 days) the paper was dried, and the ions were located photographically. The mobility and the separability of rare earths varied with the concentration of the supporting electrolyte, lactic acid. The mobility was greatest in about 1.5M acid, in which Sc trailed the unseparated rare earths. The sorbability on the paper, tested by separate chromatographic experiments with Ce, increased with decreasing acid concentration. Consequently, in acid less than 0.1M, electromigration produced slowly migrating, poorly separated zones. In 0.1M lactic acid, the rate of separation of Y from Ce increased during the electrolysis. Various cations separated in the following sequence (decreasing mobility): Cs + Rb, Sr, Ca, Co, Zn, Cu, Sc, Y^{90} + Y^{91} + Nd, Ce + Pr + Pm + Eu, Hg + Zr + Nb. The Hg + Zr + Nb did not migrate, but, if stabilized with oxalate, Zr + Nb migrated to the anode. With diammonium tartrate (0.015M) plus tartaric acid (0.035M), Ce(III) migrated as a cation, Eu and Pm as anions. The separability and the sign of the ionic charge depended on tartrate concentration and pH.

6571
FLUORESCENCE OF SAMARIUM AND GADOLINIUM IN BORAX. A. N. Zaĭdel and G. P. Malakhova. Doklady Akad. Nauk S.S.S.R. 85, 591-3(1952) July 21. (In Russian)

The fluorescence spectra of borax beads containing Sm or Gd are described.

6572
PARAMAGNETIC RESONANCE ABSORPTION IN SINGLE CRYSTALS OF GADOLINIUM NITRATE. N. S. Garif'yanov. Doklady Akad. Nauk. S.S.S.R. 84, 923-5(1952) June 11. (In Russian)

Paramagnetic resonance absorption curves, taken at orientations (100), (110), and (111) of $Gd(NO_3)_3.6H_2O$ crystals, are presented, and their relation to the structure is discussed.

6573
X-RAY-CRYSTALLOGRAPHIC STUDY OF THE HYDROGENATION OF LANTHANUM. Bertrand Dreyfus-Alain. Compt. rend. 235, 540-2(1952) Sept. 8. (In French)

La was heated at 185°C in an atmosphere of H_2. Debye-Sherrer diagrams of the product showed a f.c.c. structure with lattice constant a = 5.685 ± 0.005 A. On heating this hydride in vacuum between 25 and 300°C a second f.c.c. structure with a = 5.865 ± 0.005 A was obtained. The parameters of these two distinct structures did not vary with conditions of formation, contradicting the results of Rossi (Nature 133, 174(1934)).

SEPARATION PROCEDURES

6574
Oak Ridge National Lab.
CHEMICAL DEVELOPMENT OF RADIOCHEMICAL PROCESSES, by F. R. Bruce. [nd] Decl. with deletions Oct. 23, 1952. 12p. (AECD-3449; CF-52-10-99)

Two categories of radiochemical processing in the AEC are briefly and qualitatively discussed, namely, the processing involved in the production of the fissionable U^{233} and Pu^{239} and the recovery of unspent U^{235} fuel from power-producing reactors. Consideration is limited to the method of solvent extraction, diagrams and photographs being shown of countercurrent batch extraction and pulse column systems.

6575

Oak Ridge National Lab.

SEPARATION OF URANIUM(VI) FROM OTHER METALS BY FILTER PAPER PARTITION CHROMATOGRAPHY WITH 2-METHYLTETRAHYDROFURAN AND ITS QUANTITATIVE DETERMINATION. I. SEPARATION STUDIES BY USE OF RADIOISOTOPES, by H. P. Raaen and P. F. Thomason. [nd] Decl. with deletions Oct. 8, 1952. 42p. (AECD-3452; ORNL-1358)

The microseparation of uranium(VI) from a number of other metals has been effected by filter paper partition chromatography with H_2O-saturated 2-methyltetrahydrofuran containing 2.5% (vol) of concentrated nitric acid. The effectiveness of the separations was determined by use of radioisotopes of the metals and subsequent autoradiography of the chromatograms. The sorption gradient of the separated U^{233} was determined by alpha count measurements of the chromatograms. The conditions optimum for obtaining a condensed uranium band and for quantitative removal of uranium from the paper strip are described. Of the radioisotopes studied, Ru^{106}-Rh^{106}, Sr^{113}, Sb^{124} were not separated from U^{233}. The alpha count data are presented graphically, and positive prints of the autoradiographs are shown. (auth)

6576

Sedgwick Labs. of Sanitary Science, Mass. Inst. of Tech.

THE REMOVAL OF RADIOACTIVE STRONTIUM FROM WATER BY PHOSPHATE COAGULATION, by John B. Nesbitt, Warren J. Kaufman, Robert F. McCauley and Rolf Eliassen. Feb. 15, 1952. 128p. (NYO-4435)

In a study of methods for the decontamination of public water supplies containing radioactive cationic contaminants, the removal characteristics of Sr^{90} were investigated. Previous work on the removal of radioactive substances from water is reviewed. The fundamental mechanisms of the phosphate coagulation process in the removal of cationic contaminants from water and the basic concepts of colloid chemistry relating to absorption, coprecipitation, and flocculation are summarized. Experimental data are presented on the removal of Sr^{90} by phosphate coagulation and the removal of excess phosphate from phosphate-process effluent. Data are included from pilot-plant studies on the effect of rapid sand filtration in the removal of Sr from the phosphate-process effluent and the mechanisms by which removal is accomplished. It was concluded that a phosphate coagulation process is effective in the removal of Sr at a pH near 10.2 with excess phosphate, but that with the excessive phosphate doses required the process is not economically feasible at the present time.

SPECTROSCOPY

6577

Radiation Lab., Univ. of Calif., Berkeley

BRANCHED-CHAIN FATTY ACIDS XXVI. INFRARED SPECTRA OF SOME LONG-CHAIN 2-ALKENOIC ACIDS AND THEIR BEARING ON THE STRUCTURE OF C_{21}-PHTHIENOIC ACID, by N. K. Freeman. July 1952. 19p. (UCRL-1898)

The infrared spectra of six long-chain 2-alkenoic acids with different types of branching near the double bond are presented and discussed. Several absorption bands are observed which do not appear in the spectra of unconjugated long-chain fatty acids. One of these is the 6.1 μ carbon-carbon double bond stretching vibration band, the intensity of which has evidently been greatly enhanced as a result of conjugation. Other new bands appear in the 10 to 16 μ region, some of which may prove to be analogous to those in the spectra of alkenes which characterize the arrangement of alkyl groups around the double bond. Such a relationship has not been fully demonstrated with the limited amount of data available. Use of the 7.25-μ band intensity as an index of the number of terminal methyl groups (previously employed in branched alkenoic acids) was found to be valid for this group of alkenoic acids. Comparison of the spectra with that of C_{21}-phthienoic acid provides additional support for previous evidence that this molecule has an α-methyl branch. There is no definite indication regarding the position of a second nearby methyl group, except that the lack of spectral conformity with 2,5-dimethyl-2-heptadecenoic acid rules out this particular structure. (auth)

SYNTHESES

6578

Lankenau Hospital Research Inst., Philadelphia

METABOLISM OF NEOPLASTIC TISSUE. IV. A STUDY OF LIPIDE SYNTHESIS IN NEOPLASTIC TISSUE SLICES IN VITRO, by Grace Medes, Alice Thomas, and Sidney Weinhouse. Lankenau Hospital Research Inst., Philadelphia and Institute for Cancer Research, Philadelphia. [nd] 9p. (AECU-1681)

A study of lipogenesis in neoplastic tissues has shown that acetate and glucose carbon can be utilized for synthesis of the fatty acid chain. However, the data indicate that this process is probably too slow to supply the lipide needs of a rapidly growing tumor, and the tumor must therefore obtain its lipides preformed from the host. (auth)

6579

George Washington Univ.

FINAL REPORT [FOR THE PERIOD DECEMBER 5, 1949 THROUGH DECEMBER 4, 1951], by John Farago and Elbert B. Roberson, Jr. Mar. 31, 1952. 68p. (NP-4040; U21584)

The nitration of oximes with nitrogen tetroxide and nitric acid has been studied by using N^{15} hydroxylamine to prepare the oximes. Analysis of the nitration products shows clearly that the N^{15} of the oxime group is present in the nitration product. A unified reaction mechanism for the nitration of oximes with either nitrating agent has been proposed on the basis of the above work and a literature survey of this and allied material is included. The reaction mechanism involves free radical formation and further reaction of the intermediate to give a pseudonitrole. Other products of the nitration have been explained by the same reaction mechanism involving other free radicals present in the solution. 66 references. (auth)

6580

Pittsburgh Univ.

THE SYNTHESIS OF NITROGEN-CONTAINING KETONES. II. KETONES DERIVED FROM 1-PICOLINE, QUINALDINE AND 2,6-LUTIDINE, by Newton N. Goldberg and Robert Levine. May 19, 1952. 6p. (NYO-3377)

2-Picolyllithium, quinaldyllithium, and lutidyllithium (prepared by the interaction of the appropriate tar bases with phenyllithium) have been acylated in good to high yields with a number of aliphatic, aromatic, and heterocyclic methyl esters. While only ketones were obtained in the current acylations of 2-picoline and quinaldine, both ketones and alkyl bis(2,6-lutidyl)-carbinols were obtained when 2,6-lutidine was acylated with aliphatic esters. (auth)

6581

Pittsburgh Univ.

SYNTHESIS OF 2-(o-HYDROXPHENYL)-BENZOTHIAZOLE

AND OF 2-(o-HYDROXYPHENYL)-BENZOTHIAZOLINE, by Robert G. Charles and Henry Freiser. Issued Sept. 16, 1952. 7p. (NYO-3767)

Detailed procedures for the preparation of 2-(o-hydroxyphenyl)-benzothiazole and 2-(o-hydroxyphenyl)-benzothiazoline are outlined.

6582

Pittsburgh Univ.

STRUCTURE AND BEHAVIOR OF ORGANIC ANALYTICAL REAGENTS. IV. CHELATES OF 2-(o-HYDROXYPHENYL) BENZOXAZOLE, 2-(o-HYDROXYPHENYL) BENZOTHIAZOLE AND 2-(o-HYDROXYPHENYL) BENZOTHIAZOLINE, by Robert G. Charles and Henry Freiser. Issued Sept. 16, 1952. 26p. (NYO-3768)

The reactions of the above chelating reagents with a number of metal ions have been studied in order to evaluate the behavior of reagents containing reactive groupings analogous to those of 8-hydroxyquinoline, but so arranged as to form six membered ring chelates with metal ions. All three reagents have been found to give less stable chelates than 8-hydroxyquinoline, indicating that for this type of reagent, six membered ring chelates are less stable than five. 2-(o-hydroxyphenyl) benzoxazole and 2-(o-hydroxyphenyl) benzothiazole have been found to be potentially useful as organic precipitating agents for metal ions, being more selective than 8-hydroxyquinoline, which they somewhat resemble in behavior. In contrast to the oxazole and thiazole, 2-(o-hydroxyphenyl) benzothiazoline was found to react with most of the metal ions tried. Because of the solubility of its chelates in organic solvents, 2-(o-hydroxyphenyl) benzothiazoline may be a useful solvent extraction agent for metal ions. (auth)

6583

PREPARATION OF MACROCRYSTALLINE FLUORAPATITE CONTAINING RADIOACTIVE PHOSPHORUS. Glenn V. Elmore and E. O. Huffman. J. Am. Chem. Soc. 74, 4950 (1952) Oct. 5.

Apatite was dissolved in concentrated HNO_3 and carrier-free P^{32} as the phosphate was added. The solution was evaporated in a Pt crucible without boiling. The nitrate in the residue was decomposed at red heat. NaF then was added and fluorapatite was crystallized from the mixture. The macroscopic crystals produced were of high purity.

6584

SYNTHESIS OF 2-METHYLAMINOFLUORENE-N-METHYL-C^{14}. Juanita N. Little and Francis E. Ray. J. Am. Chem. Soc. 74, 4955-6(1952) Oct. 5.

The synthesis of 2-methylaminofluorene-N-methyl-C^{14} was undertaken in a continuation of the study of derivatives of the carcinogen 2-aminofluorene. A method applicable to the introduction of C^{14} into the methyl carbon in maximum yield was desired. For isotopic dilution experiments the compound should be free from the dimethyl and unmethylated amines. For this purpose the Na salt of 2-tosylaminofluorene (2-p-toluenesulfonamidofluorene) was treated with methyl iodide, and the resulting compound was hydrolyzed with HCl.

ENGINEERING

HEAT TRANSFER AND FLUID FLOW

6585

Argonne National Lab.

APPLICATIONS OF THE MAURO PICONE THEOREM FOR HEAT CONDUCTION, by George W. Evans, II. Sept. 1952. 18p. (AECU-2252; UAC-647)

Use is made of a restricted statement of a theorem due to Picone (Math. Ann. 101, 701-12(1929)), which essentially asserts that a non-constant solution of the heat conduction equation must have its maximum and minimum values along the boundary of the half-open xt-region of description, to prove the uniqueness of the solution u(x,t) of the differential equation $\alpha u_{xx} = u_t = Q(t)$ for $O \leq x < a$ and the differential equation $\alpha u_{xx} = u_t$ for $a < x \leq L$ for the initial condition $u(x,O) = f(x)$ and the boundary conditions $u_x(O,t) = O$, $u_x(a+,t) = u_x(a-,t) = u_x(a,t)$, $u(a+,t) = u(a-,t) = u(a,t)$, and $k u_x(L,t) = h(t)[u(L,t) - g(t)]$, where Q(t), h(t), and g(t) are known functions. The Picone theorem is also used to analyze the action of a thermal controlling unit, which consists of two thermocouples, for an oven. (auth)

6586

Massachusetts Inst. of Tech. Engineering Practice School, Oak Ridge

A STUDY OF SURFACE BOILING HEAT TRANSFER TO FREON 113, by A. A. Wasserman, A. J. Erickson, and W. L. Mann. Issued Sept. 9, 1952. 61p. (K-963)

Heat transfer in the range of nucleate and surface boiling for Freon 113 in a natural-circulation evaporator has been studied. The data have been correlated in terms of rate of heat transfer, temperature difference (wall minus saturation), and fluid properties. The effect of surface conditions on boiling heat transfer is shown. (auth)

6587

Naval Research Lab.

THERMAL CONDUCTIVITY OF SODIUM-POTASSIUM ALLOY (77.7 WT. % POTASSIUM), by Curtis T. Ewing and Robert E. Seebold. Aug. 12, 1952. 7p. (NRL-Memo-47)

The thermal conductivity of Na–K alloy, 77.7 wt. % K, has been determined between 157 and 676°C. The conductivity curve of this alloy increases from 0.2393 watts/cm-°C at 157°C to a maximum of 0.2618 at 445°C and then decreases to 0.2563 at 676°C. A graphic correlation of these results with those of two other previously reported Na–K alloys is presented. (auth)

6588

Massachusetts Inst. of Tech.

PROGRESS REPORT ON THE MEASUREMENT OF THERMAL CONDUCTIVITY OF REFRACTORY MATERIALS, by F. H. Norton, W. D. Kingery, et al. Oct. 1, 1952. 7p. (NYO-3641)

The effect of metal foil between samples in linear-flow comparison apparatus for thermal conductivity measurement has been investigated. It is found that metal foil reduces the interfacial temperature drop to an insignificant value and allows more precise measurements of thermal conductivity. The thermal conductivity of National Bureau of Standards melting point lead has been determined. The thermal conductivity of pure, sintered Al_2O_3, MgO, and BeO has been re-measured in the temperature range from 50 to 600°C. Values obtained with the metal foil are higher than previously determined due to more precise control of the linear flow. Prolate spheroid envelope samples of TiC have been investigated with variable results. Variation is believed due to electrical conduction of the samples. Cylindrical samples and spherical test samples of Al_2O_3 have been prepared and assembled and measurements are in progress. (auth)

6589

Oak Ridge National Lab.

TURBULENT FORCED CONVECTION HEAT TRANSFER IN CIRCULAR TUBES CONTAINING MOLTEN SODIUM HYDROXIDE, by H. W. Hoffman. Issued Oct. 20, 1952. 42p. (ORNL-1370)

An experimental determination has been made of the heat transfer coefficients for molten NaOH flowing in turbulent forced convection through a tube of circular cross section

and a length-to-diameter (L/D) ratio of 200. Heat transfer coefficients in the region of fully developed turbulent flow are reported for the Reynolds modulus range of 6000 to 12000 and the temperature range of 700 to 900°F. The equation, $Nu/Pr^{0.4} = 0.021\ Re^{0.8}$, was found to correlate the data for L/D values above 100. Thermal entry lengths are calculated for each run. Results show that molten NaOH may be considered an ordinary fluid—i.e., any fluid other than the liquid metals—as far as heat transfer is concerned. (auth)

6590

Radiation Lab., Univ. of Calif., Berkeley

HEAT TRANSFER IN FORCED CONVECTION FILM BOILING, by LeRoy A. Bromley, Norman R. LeRoy and James A. Robbers. Aug. 1, 1952. 70p. (UCRL-1894)

Heat-transfer coefficients in upward-flow forced-convection film boiling (liquid at b.p.) from a horizontal tube, have been measured and a theory developed. Based on the theory and the data, simple expressions are developed by which it is possible to calculate heat-transfer coefficients for this type of boiling. (auth)

6591

HEAT CONDUCTIVITY OF GASES AT LOW PRESSURES. H. Wirth and A. Klemenc. Monatsh. 83, 879-82(1952) Aug. 15. (In German)

The heat conductivities of H_2, N_2, O_2, A, CH_4, C_2H_4, and C_3H_6 were measured at 10^{-3} to 10^{-1} mm Hg pressure. The higher hydrocarbons had higher conductivities than the lower, and H_2, which has the highest heat conductivity of any gas at normal pressure, had a smaller value than any of the hydrocarbons. This suggests that heat transfer between gas and wall varies greatly for the different gases, depending on the degree of adsorption.

VACUUM SYSTEMS

6592

Atomic Energy Research Establishment, Harwell, Berks (England)

GLASS LEAK AND CONTROL VALVES, by E. R. Harrison. June 30, 1952. 6p. (AERE G/M-138)

In this glass-constructed control valve, conical or hemispherical ground glass joints are carefully lapped together and separately supported by coaxial glass tubes. On raising the temperature of the outer tube, differential expansion occurs in the axial direction, and the rate of flow of gas through the joints is controlled by controlling the temperature difference between the tubes. Over a period of 300 hours the rate of flow of gas in the valve varied by 2% when subjected to a pressure of 15 psi and the outer tube heated to a temperature of 370°C. The time constants for heating and cooling were between three and five minutes.

6593

Radiation Lab., Univ. of Calif., Berkeley

A HIGH VACUUM HIGH SPEED ION PUMP, by John S. Foster, Jr., E. O. Lawrence, and E. J. Lofgren. Aug. 27, 1952. 12p. (UCRL-1930)

A vacuum pump based on the properties of a magnetically collimated electric discharge is described. It has a speed in the range 3000 to 7000 liters a second and a base pressure in the order of 10^{-6} mm. (auth)

6594

A HIGH SPEED ROTARY VACUUM SEAL. Lawrence R. Sitney. Rev. Sci. Instruments 23, 505-6(1952) Sept.

This vacuum seal for a rotating shaft comprises two Garlock Klozures with a guard vacuum maintained between. The Klozures have annular flanges of rubber or Teflon seating on the ¼-in. shaft. The combination has held vacuums of 8×10^{-6} mm at speeds as high as 18,000 rpm.

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

6595

Alabama Univ.

COATINGS FOR THE PROTECTION OF LOW CARBON STEEL AT ELEVATED TEMPERATURES, by J. H. Handwerk and T. N. McVay. 1952. 33p. (ORO-79)

Coatings for the protection of sheet iron from oxidation at elevated temperatures were compounded. These coatings were made by adding a refractory material to the mill batch of a ground-coat enamel. Chromium oxide and aluminum hydroxide were used, and it was found that coatings containing chromium oxide did not withstand high temperatures as well as coatings containing aluminum hydroxide. Coatings containing aluminum hydroxide were tested and found to be satisfactory for protecting sheet iron at temperatures up to 1400°F for a period of one hundred hours. These coatings were also found to withstand a flame impingement test in which a temperature of 1620 to 1650°F was maintained for two hours. (auth)

GEOLOGY AND MINERALOGY

6596

Atomic Energy Project (Canada)

NATIONAL RESEARCH LABORATORIES JOINT REPORT [OF THE] DIVISIONS OF MECHANICAL ENGINEERING AND ATOMIC ENERGY [ON] AERIAL PROSPECTING FOR RADIOACTIVE MATERIALS, by E. A. Godby and S. H. G. Connock, National Research Council of Canada. Div. of Mechanical Engineering and J. F. Steljes, G. Cowper, and H. Carmichael, Atomic Energy Project (Canada). Mar. 13, 1952. 93p. (CRR-495; MR-17)

This report deals with the development, flight testing and field operation of various types of airborne equipment for the detection of radioactive materials. Since survey operational techniques and data interpretation methods are of major importance if a reliable survey is to be made, these are described in considerable detail. (auth)

6597

Massachusetts Inst. of Tech.

APPARATUS FOR THE SEPARATION OF MINERAL GRAINS, by F. E. Senftle. May 1951. 6p. (NYO-874)

An apparatus is described to facilitate the separation of mineral grains under a microscope. The grains are distributed onto a slowly revolving disc which transports the grains into the field of the microscope. A vacuum picker is then used to remove given grains from an aggregation of various types of mineral grains. (auth)

6598

Mineral Dressing Lab., American Cyanamid Co.

PILOT PLANT BATCH FLOTATION TESTS ON LOT A-200 RADIOACTIVE ORE AT MIDDLESEX WAREHOUSE, MIDDLESEX, NEW JERSEY, by J. S. Kennedy and D. M. Kentro. July 30, 1952. 34p. (NYO-1161)

The removal of sulfide minerals from U ore by flotation and the recovery of U concentration containing 1.0% S or less are outlined. Results of the various tests are tabulated.

6599

Geological Survey

RESULTS OF RECONNAISSANCE FOR URANIFEROUS COAL, LIGNITE, AND CARBONACEOUS SHALE IN WESTERN MONTANA, by William J. Hail, Jr. and James R. Gill. Sept. 1952. 22p. (TEM-446)

A reconnaissance search for uraniferous lignite and

carbonaceous shale was made in western Montana and adjacent parts of Idaho during the summer of 1951. Particular emphasis was placed on coal and carbonaceous shale associated with volcanic rocks, as volcanic rocks in many areas appear to have released uranium to circulating ground water, from which the uranium was concentrated in carbonaceous material. Twenty-two areas in Montana and one area in Idaho were examined. The coal in five of these areas is of Cretaceous age. The coal and carbonaceous shale in the remaining 18 areas occur in Tertiary "lake-bed" deposits of Oligocene and younger age. Both the Cretaceous and Tertiary coal and carbonaceous shale are associated with contemporaneous or younger volcanic rocks and pyroclastic sequences. A sample of carbonaceous shale from the Prickly Pear Valley northeast of Helena, Mont., contained 0.013 percent uranium. A sample of carbonaceous shale from the Flint Creek Valley southwest of Drummond, Mont., contained 0.006 percent uranium. All other samples of both Cretaceous and Tertiary coal and carbonaceous shale were essentially nonradioactive. (auth)

6600

RADIOACTIVITY OF SEVERAL SPRINGS IN JORDAN. F. Dupré la Tour. Rev. méd. moyen orient, 146-8(1952) Apr.-June. (In French)

The Rn and Ra contents of several springs in Jordan were measured. The Rn ranged from 0.22 to 2.42 mμc/l and the Ra from mere traces to 3×10^{-12} g/l.

METALS AND METALLURGY

6601

Institute of Science and Tech., Univ. of Ark.

ANNUAL PROGRESS REPORT [ON] RECRYSTALLIZATION OF ALUMINUM OXIDE FOR THE PERIOD, JANUARY 1, 1952 THROUGH SEPTEMBER 30, 1952. Oct. 10, 1952. 22p. (AECU-2250)

Several of the theories and some of the results of experimental work on recrystallization of Al_2O_3 in the literature are presented. An apparatus in which the vapor pressure of alumina and alumina-additive mixtures can be determined is described. A spectrophotometric procedure for the quantitative determination of Al in the presence of Mo was developed. Preliminary results of sintering studies on the effect of additions of one weight per cent of $Al(OH)_3$, $(NH_4)_2HPO_4$, NH_4BF_4, AlF_3, and NH_4F to Al_2O_3 showed that $Al(OH)_3$ increased the recrystallization of Al_2O_3 most effectively. The results obtained by the addition of 0.5 and 1.0 mole per cent of SnO_2, TiO_2, Cr_2O_3, Ti_2O_3, and Fe_2O_3 showed that the TiO_2 and Ti_2O_3 additions greatly increased the recrystallization of alumina. The effect of adding TiO_2 might be explained by Weyl's theories, but additional experimental work must be performed in an attempt to explain the effect of the Ti_2O_3 addition. (auth)

6602

Illinois Univ.

THE DIFFUSION OF ANTIMONY IN SILVER SINGLE CRYSTALS, by L. Slifkin, D. Lazarus, and T. Tomizuka. [nd] 5p. (AECU-2251)

The equation for intermetallic diffusion is $D = D_0 \exp(-Q/RT)$. Recent values for D_0 by tracer techniques have differed markedly from older data. Because the results obtained by the tracer method differed so greatly from the older data, the diffusion coefficients were redetermined using modern techniques. Initial results were obtained for the diffusion of Sb^{124} in Ag single crystals at extremely low tracer concentrations.

6603

Cambridge Univ. (England)

INTERACTIONS BETWEEN SOLID AND LIQUID METALS AND ALLOYS; SECOND ANNUAL TECHNICAL REPORT, by V. W. Eldred. Sept. 1951. 72p. (AERE-X/M-85)

A method has been developed for bringing clean surfaces of fully annealed metals in contact with filtered and degassed liquid metals and keeping them in contact for long periods, without oxide contamination, so that the rate and nature of the attack by the molten metal may be investigated. The method can be used with many of the lower melting point metals at temperatures below 500°C and may be extended to higher temperatures. Tests have been carried out at temperatures up to 400°C on pure metal systems in which little attack was anticipated. A few tests have also been included on systems in which severe attack was expected. The interpretation and practical application of the results are discussed. (auth)

6604

Committee on the Basic Properties of Liquid Metals, Office of Naval Research

LIQUID-METALS HANDBOOK, by Richard N. Lyon, ed. June 1952. 276p. (NAVEXOS-P-733(Rev.))

This second edition of the Liquid-Metals Handbook incorporates suggested improvements and additional releasable data. It offers a reasonably complete compilation of information on liquid metals covering the physical properties, industrial utilization, corrosive effects on materials, heat transfer properties, heat transfer systems, heat transfer system components, and availability for production of low-melting-point alloys.

6605

Massachusetts Inst. of Tech.

THE SEPARATION OF STACKING FAULT BROADENING IN COLD WORKED METALS, by B. E. Warren and B. L. Averbach. June 15, 1952. 5p. (NYO-768)

This material appeared in J. Applied Phys. 25, 1059(1952) and was abstracted in Nuclear Science Abstracts as NSA 6-6072.

6606

Massachusetts Inst. of Tech.

THERMODYNAMICS OF METAL SOLUTIONS; TECHNICAL PROGRESS REPORT, SCOPE I, by M. B. Bever, L. B. Ticknor, G. Scatchard and C. Wagner. Oct. 24, 1952. 2p. (NYO-922)

Brief reports are made on the progress of cold work studies, spectroscopic measurements of vapor-solid equilibrium of alloys, and general solution thermodynamics.

6607

Columbia Univ.

PROGRESS REPORT [ON] MASS TRANSFER IN LIQUID METAL AND FUSED SALT SYSTEMS [FOR] SEPTEMBER 1, 1952, by Charles F. Bonilla, Bernard Gross, Fred Kant, R. N. Roy-Choudhury, and N. S. Shaikhmahmud. [nd] 8p. (NYO-3090)

Further studies of mass transfer in liquid metals have been carried out. Attempts to cause discrete droplets of liquid lead or zinc to rise or fall short distances in the other metal, then separate before further solution occurs, were not successful on a small scale. Accordingly, mass transfer during the rise of a small volume of zinc through varying depths of lead in sealed glass tubes is being investigated. Simultaneously, measurements of the diffusivity of the system Pb-Zn are under way. Several runs have been carried out on the rate of dissolving of beds of lead shot into mercury flowing through them. Preliminary results indicate partial agreement with correlations for non-metallic liquids. Further experiments have also been carried out on the measurement of interfacial tension between fused salts and liquid metals. (auth)

6608

Carnegie Inst. of Tech.

THEORY OF GRAIN BOUNDARY DIFFUSION, by R.

Smoluchowski. Apr. 10, 1952. 22p. (NYO-3183)

This material appeared in Phys. Rev. 87, 482-7(1952) and was abstracted in Nuclear Science Abstracts as NSA 6-5392.

6609

Towne Scientific School, Univ. of Penna.

FINAL REPORT ON THERMODYNAMIC STUDY OF IRON-SULFUR-OXYGEN SYSTEM, by F. J. Dunkerley, J. L. Nichols and E. J. Delgrosso. July 15, 1952. 13p. (NYO-3393)

The equilibrium of SO_2 with liquid Fe was investigated in both dynamic and static apparatuses. The dynamic method was found more suitable in these studies so the static system was abandoned after only a few initial runs. Experimental runs were made at 1600°C using partial pressures of SO_2 ranging from 6.8×10^{-6} to 3.76×10^{-5} atm. using a constant composition for each starting melt. Another series has been almost completed using a starting composition higher in S and O. The effect of temperature was investigated by making runs under a partial pressure of 9.032×10^{-5} atm. at 1580, 1600, and 1646 ± 5°C. Runs were found to be affected by the presence of Si and silica in the refractory thermocouple protection tubes. At 1600°C, $K = 0.308 \times 10^3$ was determined for the reaction $SO_2 = S$ (% in Fe(l)) + 2O(% in Fe(l)). Gas and metal analysis methods devised in this work also are discussed, with emphasis being placed on the limitations of these analytic methods. Additional master alloys of Fe, S, and O have been made to check further the equilibrium, and stock alloy melts of Fe-Mn-O-S have been prepared for initiation of the Fe-Mn-S-O studies. Several preliminary Mn melts have been made, but the analyses are not complete. (auth)

6610

Carnegie Inst. of Tech.

PROGRESS REPORT [FOR] JULY – SEPT., 1952, by R. Smoluchowski, C. Coleman, L. Couling, S. Hayes, C. W. Haynes, A. L. Pranatis, and R. W. Turner. Oct. 15, 1952. 5p. (NYO-3483)

The work on Al–Cu and Cu–Al to determine an etch which will show the presence of Al in the grain boundaries of a diffused specimen of Cu is reported. A pronounced anisotropy of diffusion in grain boundaries in the Cu–Ag system was observed. The volume diffusion penetration of Fe–Si was found to be approximately 0.0008 in. and the grain boundary diffusion between 0.0010 to 0.0015 in.

6611

Massachusetts Inst. of Tech.

SOLID SOLUTIONS AND GRAIN BOUNDARIES; TECHNICAL PROGRESS REPORT NO. 13, SCOPE II, by B. L. Averbach, M. Cohen, P. S. Rudman, E. E. Underwood, W. F. Flanagan and J. Hilliard. Sept. 30, 1952. 2p. (NYO-3809)

A brief report is given of the preliminary studies of solid solutions in an attempt to determine the relationship between their atomic arrangements and thermodynamic properties.

6612

Massachusetts Inst. of Tech.

FUNDAMENTALS OF COLD WORKING AND RECRYSTALLIZATION; TECHNICAL PROGRESS REPORT NO. 8, SCOPE III, by B. L. Averbach, M. Cohen, S. Allen and P. Fopiano. Sept. 30, 1952. 2p. (NYO-3810)

X-ray studies are being made of the changes which occur in metallic crystals after cold working and also after annealing treatments. A brief report is given of the preparation and preliminary studies of these crystals.

6613

General Electric Research Lab.

EFFECT OF IMPURITIES ON THE SELF-DIFFUSION OF SILVER, by R. E. Hoffman and D. Turnbull. Sept. 1952. 7p. (SO-2023; RL-744)

The effect of small amounts of Pb (up to 1.3 at. %) on the self-diffusion coefficient of Ag has been measured between 700 and 800°C. Results show that, within the ranges of the variables investigated, the self-diffusion coefficient at a given temperature increases linearly with Pb concentration, while the activation energy for self-diffusion in any of the alloys is very nearly the same as in pure Ag. A mechanism has been proposed which satisfactorily accounts for these results and from which predictions can be made concerning the magnitude of the self-diffusion of Pb in these same alloys. (auth)

6614

TENSILE DEFORMATION OF SINGLE CRYSTALS WITH ROTATING HOLDERS. Jörg Diehl and Albert Kochendörfer. Z. angew. Physik 4, 241-7(1952) July. (In German)

In order to avoid the macroscopic distortion of the glide lamellae in the region of the specimen holder during the usual tensile-deformation studies, in which the holder is rigidly connected with the tensile apparatus, an apparatus was developed on the Polanyi principle in which the holder rotates freely during the deformation. Comparative experiments with fixed and rotating holders on the critical shear stress, hardening, relaxation, and Laue asterism of especially long Al single crystals gave only slightly different results, indicating that the type of holder has an insignificant effect on plastic deformation of sufficiently long crystals.

6615

EQUILIBRIUM MEASUREMENTS IN THE Mo–C–H SYSTEM. L. C. Browning and P. H. Emmett. J. Am. Chem. Soc. 74, 4773-4(1952) Oct. 5.

Equilibrium data for the reaction $2Mo + CH_4 = Mo_2C + 2H_2$ have been obtained in the temperature range 447 to 682°C. The solid phases present were confirmed by means of x-ray spectrograms. Equilibrium data for the reaction $Mo_2C + CH_4 = 2MoC + 2H_2$ have been determined in the temperature range 663 to 825°C. In the temperature range studied, both Mo_2C and MoC are thermodynamically stable with respect to C and Mo. (auth)

6616

NITROGEN IN METALS. David O. Caldwell. Rev. Sci. Instruments 23, 501-2(1952) Sept.

Fe and Mn were studied for N presence by bombarding them at different radii in the U.C.L.A. 41-in. synchrocyclotron and obtaining crude excitation curves. The N activities detected were the 76.5-sec $N^{14}(p,n)O^{14}$ and the 20.3-min $N^{14}(p,\alpha)C^{11}$. From the decay curves, the estimate of the N impurity in the Fe used (spectroscopically pure) was about 1%. The Mn appeared to have a somewhat lower concentration.

PHYSICS

6617

Wisconsin Univ.

THERMOLUMINESCENCE AS A RESEARCH TOOL, by Farrington Daniels, Charles A. Boyd, and Donald F. Saunders. [nd] 26p. (AECU-2269)

Progress in the application of thermoluminescence to a variety of research problems is outlined. Research applications include dosimetry, identification, catalysis, radiation damage, thermoluminescence of rocks, stratigraphy, and age determinations. The mechanisms of thermoluminescence and types of thermoluminescent materials are also discussed.

6618

Carbide and Carbon Chemicals Co. (K-25)

TEMPERATURES OF UNDERGROUND CABLES, by H.

Zabronsky. Issued Sept. 2, 1952. 51p. (K-946)

Formulas are obtained for the mean steady-state temperatures attained by underground cables encased in concrete banks. Curves and tables are presented for the mean temperatures as functions of the thermal conductivity of the banks and the distance between consecutive banks. (auth)

6619

Laboratory for Nuclear Science, Mass. Inst. of Tech. [TWENTY-SIXTH] PROGRESS REPORT [FOR] PERIOD MAY 31, 1952 TO AUGUST 31, 1952.] Aug. 31, 1952. 92p. (NP-4119)

Separate abstracts have been prepared for four sections of this report.

6620

Laboratory for Nuclear Science, Mass. Inst. of Tech. CHEMISTRY OF THE FISSION ELEMENTS GROUP and COSMIC RAY GROUP and ELEMENTARY PARTICLE SCATTERING GROUP, p.1-27 of TWENTY-SIXTH PROGRESS REPORT FOR PERIOD MAY 31, 1952 TO AUGUST 31, 1952. Aug. 31, 1952. 27p. (NP-4119(p.1-27))

Progress is briefly reported on the following: analytical chemistry of Ce, Cd halide complexes, analytical chemistry of Nb, thermometric titrations, and spectrophotometric determination of heavy metals. Preliminary results are presented on the decay schemes of S and V particles. Designs of a high-pressure double ion chamber for the measurement of air absorption of high-energy particles from nuclear reactions and a large scintillation counter are given. Neutral π meson production from proton-photon interactions is discussed. Fast photoproton production by a synchrotron beam and photonuclear experiments with the linear accelerator and synchrotron are reported.

6621

Laboratory for Nuclear Science, Mass. Inst. of Tech. ONR GENERATOR GROUP and RADIOACTIVITY AND CYCLOTRON GROUP, p.51-85 of TWENTY SIXTH PROGRESS REPORT FOR PERIOD MAY 31, 1952 TO AUGUST 31, 1952. Aug. 31, 1952. 35p. (NP-4119(p.51-85))

A survey is made of deuteron and proton reactions with C and O nuclei. Reactions studied include $C^{12}(d,\alpha)B^{10}$, $C^{13}(d,\alpha)B^{11}$, $C^{12}(p,p)C^{12}$, $C^{12}(d,d)C^{12}$, $C^{12}(d,p)C^{13}$, $C^{13}(d,p)C^{14}$, $O^{16}(d,\alpha)N^{14}$, and $O^{16}(d,p)O^{17}$. A study of the particle groups emitted at 90° when B targets evaporated on Formvar are bombarded with deuterons and protons is reported. The Zeeman and hyperfine splitting of positronium was investigated. The spectral distribution of backscattered γ rays from an I^{131} source with wood, Al, and Pb backing is reported. Design of a G-M counter for low γ-ray intensities is described. Measurement of the shape of the β-ray spectrum of K^{40} using a liquid A ionization chamber is reported. The γ-ray spectrum from the reaction $C^{12}(p,p\gamma)C^{12}$ for a 4.45-Mev energy release is shown. Angular distributions of several (d,p) reactions are reported.

6622

Laboratory for Nuclear Science, Mass. Inst. of Tech. SYNCHROTRON GROUP and THEORETICAL GROUP, p.86-92 of TWENTY-SIXTH PROGRESS REPORT FOR PERIOD MAY 31, 1952 TO AUGUST 31, 1952. Aug. 31, 1952. 7p. (NP-4119(p.86-92))

Preliminary results are reported on the detection of π mesons. The possible forms of relativistic equations describing particles of spin greater than $(\frac{1}{2})n$ are shown. Explanation of strong coupling features of meson theory by postulating the existence of nucleon isobars was attempted.

6623

Pittsburgh Univ.

THE HEAT CAPACITY OF MAGNESIUM BETWEEN 12°K AND 320°K AND THE ENTROPY OF MAGNESIUM AT 25°C; PROGRESS REPORT FOR JULY 1, 1952 – OCTOBER 1, 1952, by R. S. Craig, W. E. Wallace, L. W. Coffer, and C. A. Krier. Oct. 10, 1952. 4p. (NYO-950)

The constant-pressure heat capacity for Mg is reported for temperatures ranging from 12 to 320°K. Values for the constant-volume heat capacity and θ, the Debye characteristic temperature, are also reported for selected temperatures between 12 and 300°K. The entropy of Mg at 25°C was found to be 7.776 cal/mole-degree. (auth)

6624

Oak Ridge National Lab.

PHYSICS DIVISION QUARTERLY PROGRESS REPORT FOR PERIOD ENDING MARCH 20, 1952. Issued Oct. 22, 1952. 54p. (ORNL-1289)

Progress is reported on the following projects: energy spectrum of protons from He^3 bombarded by He^3, energy spectrum of particles from H^3 bombarded by He^3, proton bombardment of light elements, (p,n) thresholds in Ne, angular correlation of γ rays, K-shell internal conversion coefficient measurements, neutron-diffraction studies of superconducting elements, neutron-diffraction studies of some rare earths, total neutron cross sections at In resonance energy of 1.44 ev, specific heat of $Nd(C_2H_5SO_4)_3 \cdot 9H_2O$ from 1 to 2°K, measurement of the Weiss constant in $CuK_2(SO_4)_2 \cdot 6H_2O$, superconductivity of a Hf–Zr alloy, space distribution of ionization in a gas, neutron decay, neutron cross sections, theory of T + D reactions, and the parameterization of quantum electrodynamics.

6625

Radiation Lab., Univ. of Calif., Berkeley

SUMMARY OF WEEKLY RESEARCH PROGRESS MEETINGS OF JULY 3, 10, AND 17, 1952, by Sergey S. Shewchuck. Aug. 22, 1952. 8p. (UCRL-1906)

Progress on Physical Analysis of High Energy Disintegration Products. W. H. Barkas. In order to gain greater insight into the processes of high-energy disintegration, other information besides chemical analysis of the products was obtained. This information includes populations of various kinds of nuclei, momentum distributions, angular distributions, variation with beam and beam energy, and variation with kind of target. Only data for 330-Mev protons on Be and C are given. π^- Meson Scattering by Aluminum. J. F. Tracy. Photographs of tracks from scattering and absorption were obtained using a 340-Mev proton beam on a two-in. polyethylene target in the cave and thence into the cloud chamber containing, in parallel, five Al plates 3½ in. high and ⅛ in. thick. The tentative differential scattering cross sections for various angles are shown. Also tabulated are the numbers of events and total cross sections for all scattering $\geq 30°$.

6626

Radiation Lab., Univ. of Calif., Berkeley

SUMMARY OF RESEARCH PROGRESS MEETING OF AUGUST 14, 1952, by Sergey Shewchuck. Sept. 4, 1952. 7p. (UCRL-1924)

Positive and Negative Meson Production by Protons. J. Carothers. This talk summarized experiments conducted with protons on H, D, and He for positive and negative meson production. Primary attention was directed at D and the positive-to-negative meson ratio. Regularities in Binding Energies of Neutrons and Protons in Light Nuclei and in Energies of Excited States of Heavy Nuclei. Martin Redlich. The first part of this talk concerning regularities in the binding energies of neutrons and protons in light nuclei is the subject of an article in Phys. Rev. 88, 38-9 (1952). The second part of the talk concerning regularities in energies of excited states of heavy nuclei is summarized.

6627

Radiation Lab., Univ. of Calif., Berkeley

SUMMARY OF THE RESEARCH PROGRESS MEETING OF

JUNE 12, 1952, by Margaret Foss Folden. Sept. 5, 1952. 6p. (UCRL-1933)

The Use of Electron Track Plates in Mass Spectroscopy. F. L. Reynolds. Very small quantities of α emitters among the collected mass spectra lines can be located by means of the α tracks produced in a transfer emulsion. The same technique could be used with electron-track sensitive plates, but the existence and augmenting of the track background makes electron work a more formidable problem. Some of the problems connected with the possible use of electron-track plates as transfer-plate detectors are described, and some techniques of eradication of existing tracks and possible other methods of by-passing the eradication step are discussed. The Use of Annihilation of Positrons in Flight to Give a Peaked Gamma Ray Spectrum. Stirling A. Colgate. The γ-ray spectrum from electron-positron annihilation events is strongly peaked at the high- and low-energy ends. The spectrum of annihilation plus bremsstrahlung for positrons passing through a low-atomic-number material is favorable from 10 Mev to 200 Mev for threshold-type experiments. 10-Mev positrons passing through ½ cm LiH give an annihilation peak 10% of the bremsstrahlung spectrum. 200-Mev positrons passing through $\frac{1}{100}$ radiation length (20 cm) of liquid H give a peak 6 times the bremsstrahlung intensity and 3% wider.

6628

Radiation Lab., Univ. of Calif., Berkeley

SUMMARY OF THE RESEARCH PROGRESS MEETING OF JULY 31, 1952, by Sergey Shewchuck. Sept. 18, 1952. 5p. (UCRL-1952)

Further Considerations on Spontaneous Fission. Gary Higgens. A recalculation was made of the spontaneous fission rate of Cm^{240} reported in UCRL-1772. The new values are $4.0 \pm 0.2 \times 10^{12}$ fissions/gm-hr and $7.9 \pm 0.4 \times 10^{5}$ yr half life. Neutron Time of Flight Instrumentation. W. Linlor. This report describes preliminary work being done with time-of-flight measurements on particles with velocities approaching that of light. The deuterons strike a 1-in. Cu or 4-in. Be probe in the 184-in. cyclotron. The neutrons go through the collimator, and the stripped protons provide the amplified pulse. The r-f phase signal to the cyclotron deflector circuit is obtained with the aid of a synchronizer unit. It was found that γ-ray pulses appeared on the traces, thus providing an effective means of calibrating the lead delays. The formula for measurement is $T_n = T_\gamma + Ax$, where T_n is the neutron time of flight, T_γ is the γ time-of-flight, A is 10^{-8} sec per unit distance on the scope-screen, and x is the scope-screen distance from the γ rays to the point of rise of the neutron pulse. The calculated energy resolution at energies from 1 to 350 Mev is shown.

COSMIC RADIATION

6629

New York Univ., Coll. of Engineering

COSMIC RAY PROJECT; NEUTRON PRODUCTION IN THE COSMIC RADIATION, REPORT NO. 101.15, by Arthur Beiser. [nd] 35p. (NP-4069; Report No. 101.15)

A general analytical procedure for the evaluation of nucleon production in cosmic ray nuclear disintegrations occurring in nuclear emulsions is described. The formulas and numerical quantities required in the analysis of such disintegrations were derived and applied to a specific case experimentally investigated by a number of other laboratories. A subsidiary experiment was performed to determine the validity of an assumption made in this work. An explanation is proposed for the discrepancy between the calculated result for neutron production at a given altitude and that measured by counters, and an experiment to test this hypothesis is suggested. (auth)

6630

IONIZATION LOSS AT RELATIVISTIC VELOCITIES IN NUCLEAR EMULSIONS. Maurice M. Shapiro and Bertram Stiller. Phys. Rev. 87, 682-4(1952) Aug. 15.

The rate I of energy loss, by ionization, of relativistic velocity particles in nuclear emulsions has been examined by means of grain density measurements in a set of 400-μ Ilford G.5 emulsions exposed to cosmic radiation at an altitude of 100,000 ft. Two groups of tracks were examined: (1) thin shower tracks ("s tracks") emerging from nuclear explosions, and (2) "p tracks", provisionally attributable to incident star-producing particles. Histograms are given showing frequency of distribution in grain density of the two tracks.

6631

IONIZATION BY COSMIC-RAY MESONS IN ARGON. G. W. McClure. Phys. Rev. 87, 680(1952) Aug. 15.

Ionization by cosmic-ray mesons in A (20 atm.) was studied by means of an electron-collection ionization chamber. The experimentally determined values of the energy losses of the cosmic-ray mesons compare well with the calculated values.

6632

THE ENERGY SPECTRUM OF THE ELECTRONS IN THE EXTENSIVE COSMIC-RAY SHOWERS. Carmelo Milone. Phys. Rev. 87, 680-1(1952) Aug. 15. (cf. NSA 6 – 5128)

The energy spectrum of the electrons in extensive air showers was studied by means of appropriately placed and appropriately shielded G-M counters. The results obtained are not in agreement with theoretical predictions, assuming that the showers are produced near the top of the atmosphere by a primary electron or photon of 10^{14} to 10^{16} ev. Better agreement between theory and experiment can be placed if the assumption is made that the primary-electron hypothesis is wrong and that the electrons produced in an extensive shower near sea level are produced mainly in the air not far above the apparatus.

6633

ELECTRON TRACK RECOGNITION IN NUCLEAR EMULSIONS. Arthur Beiser. Rev. Sci. Instruments 23, 500-1 (1952) Sept.

Investigation was made of the number of low-energy electron tracks that escape observation in nuclear emulsions as a function of the fog background. Artificial random backgrounds with random distributions of fog grains of several frequencies per unit were used in conjunction with a number of electron track representations, various combinations of the two being superimposed and inspected visually. The test seems to have validity in rating scanning ability.

6634

PROBABILITY OF LOCALIZATION OF ELECTRONS IN EXTENSIVE SHOWERS. G. Poiani and C. Villi. Nuovo cimento (9) 9, 825-33(1952) Sept. (In Italian)

The radial distribution of electrons in air showers is studied on the basis of the cascade theory of the photo-electronic component worked out by the Padua group. It is found that the probability of a singly scattered electron to be localized in the annular ring (x', dx') (x' in Moliére units) is $P(x')dx' = 0.153(dx'/x'^2)$. This result is compared with the predictions of other theories. (auth)

6635

EXISTENCE OF HIGH-ENERGY DEUTERONS IN COSMIC RAYS. G. A. Marikyan. Doklady Akad. Nauk S.S.S.R. 85, 305-7(1952) July 11. (In Russian)

Measurements with a magnetic spectrometer and Pb absorbers at 3200 m altitude indicate the presence of cosmic-ray deuterons. The number of deuterons of 200 to 310 Mev is 9 ± 2% of the number of protons of 150 to 230 Mev.

6636

AZIMUTHAL ASYMMETRY OF COSMIC RADIATION IN THE STRATOSPHERE AT THE EQUATOR. S. N. Vernov,

A. M. Kulikov, and A. N. Charakhch'yan. Doklady Akad. Nauk S.S.S.R. 85, 525-8(1952) July 21. (In Russian)

Zenithal and azimuthal cosmic-ray asymmetries at altitudes of 10, 15, 21, and 26 km above the equator are plotted and analyzed into east-west and north-south effects.

6637
MEASUREMENT OF IONIZING POWER OF PARTICLES IN A NEW MAGNETIC SPECTROMETER. V. Kharitonov. Doklady Akad. Nauk S.S.S.R. 85, 71-4(1952) July 1. (In Russian)

A magnetic spectrometer and coincidence counter arrangement is described, and data obtained therewith on ionizing power of penetrating mesons and protons of various ranges from 1 to 6 cm in Pb are tabulated.

6638
VARIATION OF COSMIC RAY INTENSITY ASSOCIATED WITH SOLAR ACTIVITY. A. I. Ol. Priroda, 48-52(1951) Nov. (In Russian)

Data on correlation of sun-spot activity with cosmic-ray intensity are collected to support the hypothesis that eruptions in the chromosphere can eject particles with energies of 10^9 to 10^{10} ev. 17 references.

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

6639
Brookhaven National Lab.
NOTE ON THE CRYSTALLINE ELECTRIC FIELD IN NICKEL AMMONIUM SULPHATE, by L. M. Corliss, J. F. Ollom and J. H. Van Vleck. Brookhaven National Lab. and Harvard Univ. [nd] (BNL-200)

Some calculations based on the crystalline-field model of tetragonal symmetry are presented to show that the splitting of the ground-state triplet of Ni^{++} in $Ni(NH_4)_2(SO_4)_2 \cdot 6H_2O$ obtained from the paramagnetic anisotropy measurements of A. Basu is reasonably consistent with that deduced by Griffiths and Owen from measurements of microwave resonance absorption. This fact confirms the rather daring proposal of Griffiths and Owen that the axes of the crystalline field have a different orientation in the nickel than in the similar copper Tutton salt. Preliminary measurements of paramagnetic relaxation in $Ni(NH_4)_2(SO_4)_2 \cdot 6H_2O$ by C. J. Gorter require a splitting which appears to be in substantial agreement with the Griffiths and Owen energy-level scheme. (auth)

6640
National Bureau of Standards
FINAL REPORT [ON] GROWING BERYLLIUM OXIDE CRYSTALS, by Ernest M. Levin, Gerald F. Rynders, and Raymond J. Dzimian. July 1952. 52p. (NBS-1916)

The vapor transport, fused KOH solution, and hydrothermal methods were applied to the problem of growing BeO crystals. All three methods were successful in producing increased crystal size, but the major objective of producing single large crystals was not accomplished. The largest crystal obtained was by the vapor transport method, the cross section increasing from 0.25 mm to 0.45 mm, while the length of 2.5 mm remained unchanged. The solution method was abandoned because of opposing chemical effects and physical design difficulties. The hydrothermal method was only moderately successful for the temperatures and pressures used, but would probably show the most promise at higher temperature and pressures.

6641
Radiation Lab., Univ. of Calif., Berkeley
THE CRYSTAL STRUCTURE OF OSMIUM TETROXIDE, by Allan Zalkin and D. H. Templeton. Sept. 5, 1952. 4p. (UCRL-1941)

X-ray diffraction data imply that the OsO_4 molecule is tetrahedral or nearly tetrahedral, although O positions could not be derived from the observed intensities. Twinning, corresponding to reflection in the (001) plane, was observed and the shortest intermolecular O–O distances are between molecules whose centers are in this plane.

ELECTRONS

6642
CONTORTED TRAJECTORIES OF CHARGED PARTICLES IN MAGNETIC FIELDS WITH A PLANE OF SYMMETRY. J. Lafoucrière. J. phys. radium 13, 392-400(1952) July-Aug.-Sept. (In French)

A general method is given for construction of the complicated, contorted trajectories of charged particles in an inhomogeneous magnetic field having a symmetry plane and a sharp radial decrease in strength. The problem of axial focusing of stationary orbits is discussed.

6643
A METHOD OF CALCULATING TRAJECTORIES IN ELECTRON OPTICS; GENERALIZATION TO HOMOGENEOUS LINEAR DIFFERENTIAL EQUATIONS. F. Bertein. J. phys. radium 13, 91A-98A(1952) July-Aug.-Sept. Suppl. (In French)

An approximation method previously derived (NSA 6-4110) for trajectories in electron optics is reconsidered in a more general form in order to better judge its applicability. Several conclusions are drawn concerning the choice of functions and the possibility of improving the approximation to any given order.

6644
PARAXIAL ELECTRON TRAJECTORIES IN ELECTROSTATIC LENSES. Charles Fert. J. phys. radium 13, 83A-90A (1952) July-Aug.-Sept. Suppl. (In French)

Tracing the curve of paraxial electron trajectories in electrostatic lenses can be simplified by using "matrices" or "tables" of transformations characteristic of intervals or surfaces, following a classical optical method. After describing the conventions and equations used in employing these tables, the author presents several examples of their application.

6645
AN AUTOMATIC TRACER OF ELECTRON TRAJECTORIES. F. Cassanas and P. Barchewitz. J. phys. radium 13, 73A-83A (1952) July-Aug.-Sept. Suppl. (In French)

An automatic tracer of electron trajectories in any electrostatic field representable in an electrolytic tank is described. The trajectories thus obtained are flat and do not contain relativistic corrections. It is assumed that no magnetic field interferes and that the electrostatic field created by the electrodes is not a function of time. A theoretical study of the principle of the apparatus is given, as well as some results obtained in operation. The device offers the possibility of functioning as an automatic tracer of equipotentials.

GASES

6646
EFFECT OF INTERMOLECULAR COLLISION ON MOLECULAR GAS FLOW. I. LONG CIRCULAR-CYLINDRICAL TUBES. II. SLIT BETWEEN FLAT PLATES; PERFORATED DIAPHRAGM; SHORT TUBES; POROUS MEDIUM. J. W. Hiby and M. Pahl. Z. Naturforsch. a7, 533-53(1952) Aug. (In German)

In molecular flow (mean free path $\lambda \gg$ mean wall distance, intermolecular collisions cause deviations from the ideal ($\lambda \to \infty$), thus weakening or intensifying the flow according to the geometrical shape of the flow-resisting device. Kinetics of the relatively rare intermolecular collisions can be approximated, assuming a sufficiently small pressure gradient, by consideration of the problem of single scattering of mole-

cules in a gas having Maxwell's velocity distribution, for which a directional distribution function is derived on the basis of a rigid-elastic-sphere model. An approximation equation is derived for the conductance $\underline{F}$ of a long, circular-cylindrical tube in the molecular flow region as a function of the average gas pressure $\bar{p}$. A comparison with the measurements of Knudsen, Gaede, and Klose gives the value 0.98 ± 0.01 for the Maxwell reflection coefficient $\underline{f}$ for H_2, N_2, O_2, and CO_2. Problems of the definition of this coefficient are discussed.

The conductance $\underline{F}$ of a slit decreases (in the molecular flow region) with increasing pressure $\bar{p}$ much more sharply than that of a long tube. In contrast, there is a linear increase of $\underline{F}$ with $\bar{p}$ for a perforated diaphragm. Both results agree with the measurements of Gaede and Knudsen. For short tubes and tubes with a short constriction a linear pressure dependence is always found for $\underline{F}$; the proportionality factor therefore has a sensitive dependence on the tube length/diameter ratio. The disparate measurements by different authors of this factor for molecular flow in porous media can accordingly be traced to differences in the pore structures.

INSTRUMENTS

6647

Argonne National Lab.

THE EFFECTIVE LENGTH OF AN ELECTROSTATIC ANALYZER, by J. E. Monahan. Sept. 1952. 14p. (AECU-2254; UAC-646)

The general formula for the effective length of an electrostatic analyzer with "rounded" corners is derived using a modified Schwartz transformation. For the dimensions considered, the rounded-corner effect introduces a correction of about 0.1% in the evaluation of the effective length of the analyzer. (auth)

6648

Wisconsin Univ.

A CONVENIENT SOURCE OF GAMMA RADIATION, by Donald F. Saunders, Frederick F. Morehead, Jr. and Farrington Daniels. [nd] 10p. (AECU-2268)

A simple irradiator is described which gives intense and uniform gamma radiation from Co^{60} for laboratory experiments involving objects of relatively small size. The irradiator was made by filling the hollow space between two concentric Al cyclinders with Co powder and irradiating it in the nuclear reactor at the Argonne National Lab.

6649

Los Alamos Scientific Lab.

THE GATED DECADE, by E. L. Kemp. July 1952. 12p. (LA-1451)

This five-stage gated decade combines the features of binary systems with those of decade systems. The lessening of the decade bias range by feedback in typical decade systems is overcome by using a switched gate. A scaler employing three gated decades was used to count particles in radioactive decay. The scaler thus used had a maximum counting speed of 700,000 cpm and gave satisfactory performance for as long as a three-month period of 24 hr/day operation.

6650

Atomic Energy Project, Univ. of Calif., Los Angeles

AN EXTERNAL CONTROL OF THE SPACING OF THE PROJECTOR POLE-PIECE ELEMENTS OF THE RCA EMU ELECTRON MICROSCOPE, by F. W. Bishop and S. B. Elliott. Issued Oct. 8, 1952. 10p. (UCLA-227)

A mechanical device to change the projector pole-piece spacing of the electron microscope with the microscope in operation is described. It permits operation of the instrument over its most useful ranges of magnification without having to break the vacuum to manually interchange lens elements and thus reduces the opportunity for contamination or accidental damage to the pole-pieces. (auth)

6651

A DIRECT READING ELECTROMETER. Robert M. Dowben. Rev. Sci. Instruments 23, 506-7(1952) Sept.

A simple electrometer and d-c amplifier is described which is stable to small variations in the supply and uses receiving-type vacuum tubes throughout. Because of freedom from parasitic oscillations, obviating the use of suppressor condensers, and the large amount of feedback, the effective input capacitance is made small, and rapid response is obtained. (auth)

6652

A BRIDGE TEE DETECTOR FOR NUCLEAR MAGNETIC RESONANCE. Charles E. Waring, Richard H. Spencer, and Robert L. Custer. Rev. Sci. Instruments 23, 497-8(1952) Sept.

The circuit of a bridged tee network for the measurement of nuclear magnetic resonance is described. This circuit was used to measure the field strength of a large air core solenoid. The balance equations for the bridged tee network are:

$$W^2 = 1/L\left(\frac{C_1C_2}{C_1 + C_2}\right), \; R = \frac{L}{(C_1 + C_2)}r.$$

The probe contained one ml of No. 20 lubricating oil with B and S No. 17 copper wire wound directly on the proton sample cell to give convenient resonance capacities and a convenient resonant impedance (500 to 25,000 ohms) near the 20-Mc working frequency. The simplicity of construction, the general utility, and the adaptability to ordinary laboratory apparatus prove the circuit to be excellent for detecting nuclear magnetic resonance. (auth)

6653

A VERSATILE ELECTROSTATIC ELECTRON GUN. Albert J. Druce. Rev. Sci. Instruments 23, 499-500(1952) Sept.

In this electrostatic focusing electron gun, emphasis was placed on many adjustments, rather than on accurate machining and careful assembly. The grid is the fixed element, all others being adjustable to it. The filament can be moved in all three directions with respect to the grid without breaking the vacuum. There is an "O"-type ring gasket provided with each movable seal, preventing leaks when adjustments are made.

MASS SPECTROGRAPHY

6654

Argonne National Lab.

INVESTIGATION OF THE HEAT OF VAPORIZATION OF CARBON, by William A. Chupka, Mallinckrodt Chemical Lab., Harvard Univ. and Mark G. Inghram, Chicago Univ. and Argonne National Lab. Sept. 1952. 4p. (AECU-2255; UAC-645)

Atoms evaporated from a C filament were bombarded with controlled-energy electrons and the mass of the ions determined by a standard single-focusing magnetic analyzer. Identification was made by both mass and appearance potential. In addition further studies were made by retarding-potential techniques. Theoretically, C atoms may evaporate over a potential barrier which would give resulting atoms an excess kinetic energy in an amount equal to the difference between the heat of sublimation and the activation energy. The excess kinetic energy would be subtracted from the apparent heat of vaporization obtained by temperature plots of evaporation from a surface to get the true heat of sublimation. The value thus obtained was 171 ± 10 kcal/mole.

6655

AN ABSOLUTE DETERMINATION OF THE X-LINE FROM

ThC''. Gunnar Lindström. Phys. Rev. 87, 678-9(1952) Aug. 15.

The determined values $\nu\rho = 42.5212 \pm 0.0060$ Mc-cm and $H\rho = 9986.7 \pm 1.5$ gauss-cm gives $E_\gamma = 2.61425 \pm 0.00050$ Mev. These values are in good agreement with the values $\nu\rho = 42.528 \pm 0.008$ Mc-cm and $H\rho = 9988.4 \pm 2$ given by Brown (Phys. Rev. 83, 271(1951)).

6656
DECREASE OF N^{15} TO N^{14} RATIO MEASUREMENT AS A FUNCTION OF PUMP-OUT TIME FOR NIER-TYPE ISOTOPE-RATIO MASS SPECTROMETER. James George. Anal. Chem. 24, 1662-4(1952) Oct.

During the course of several series of measurements of the natural abundance of N^{15} in tank N_2 with a Nier-type isotope-ratio mass spectrometer, abnormally high value for the m/e 29/28 ratios were initially observed. This phenomenon occurred sequentially whenever operation of the instrument was discontinued, either by a brief interruption resulting from power failure, or by a more prolonged intentional shutdown and venting of the analyzer tube with He. Installation of a dry-ice trap in the manifold system to prevent diffusion of fore-pump oil vapor into the analyzer tube resulted in much more rapid attainment of constancy of the m/e 29/28 ratios. Under the optimum conditions values found for the abundance of N^{15} in tank N_2 and in thermally decomposed ammonium dichromate were 0.3710 and 0.3747, respectively. This compares with the generally accepted average value of 0.38.

6657
RECORDING SYSTEM FOR MASS SPECTROMETERS. K. K. Jensen, W. E. Bell, and F. E. Blacet. Anal. Chem. 24, 1614-15(1952) Oct.

A system for recording mass spectra, using a vibrating reed electrometer, has been installed on a Westinghouse type LV mass spectrometer. This system is relatively economical in cost, simple in operation, accurate and dependable, and produces rapidly a directly readable chart on a pen recorder. The installation consists of a control box containing a Helipot and a magnet current meter, a vibrating reed electrometer and amplifier, a recorder, and a calibrating potentiometer. (auth)

MATHEMATICS

6658
THE VIRIAL THEOREM IN THE THOMAS-FERMI THEORY. N. H. March. Phil. Mag. (7) 43, 1042-6(1952) Oct.

A discussion of the virial theorem for both Thomas-Fermi and Thomas-Fermi-Dirac systems is given, the results being more general than have hitherto been obtained. The particular case of a homonuclear diatomic molecule is briefly considered. (auth)

6659
THE SPATIAL CORRELATION OF ELECTRONS IN ATOMS AND MOLECULES. II. TWO-ELECTRON SYSTEMS IN EXCITED STATES. A. Brickstock and J. A. Pople. Phil. Mag. (7) 43, 1090-9(1952) Oct.

This paper extends the treatment of the ground state of helium and similar two-electron systems to excited states which are not spherically symmetric. The wave function is expanded in a series of surface harmonics, the coefficients being functions of the radial distances. Symmetry considerations and the angular momentum operators are used to simplify the problem and a set of coupled equations for the radial functions are then given. This general theory is exact. In the final section it is used to discuss the effect of the exclusion principle on angular correlation in atomic P-state and is applied to excited states of beryllium. (auth)

MEASURING INSTRUMENTS AND TECHNIQUES

6660
Argonne National Lab.
SOME OPTICAL PROPERTIES OF POTASSIUM IODIDE-THALLIUM PHOSPHORS, by Philip H. Yuster and Charles J. Delbecq. Sept. 5, 1952. 28p. (AECU-2258; UAC-640)

The original purpose of the work was to discover whether the presence of a thallous ion in a KI crystal perturbs the transition in the neighboring iodide ions in a manner similar to the perturbation caused by the presence of an F-center or a negative ion vacancy (Delbecq, J. Chem. Phys. 19, 574(1951)). Such a perturbed transition is believed to have been found and also, in the course of the investigation, a number of new absorption bands were observed. These spectra were measured by spectrophotometric means, using different concentrations of Tl with the KI crystals.

6661
Los Alamos Scientific Lab.
VARIOUS PENETRAMETER TYPES AND THEIR LIMITATIONS, by Norman C. Miller and Gerold H. Tenney. Oct. 7, 1952. 29p. (AECU-2272; LADC-1245)

An experiment is described in which steel blocks of various thicknesses have been radiographed with penetrameters of several types, and artificial cavities placed at different levels within the blocks. A 1000 kvp x-ray unit, a Co^{60} isotope, and a 22-Mev betatron have been used as sources of radiation. Correlation has been found among the resolved images of the various penetrameter types and the shadows of the cavities with regard to their geometrical locations; conclusions are indicated concerning the validity of various penetrameter usages. (auth)

6662
Brookhaven National Lab.
A DOSIMETRIC STUDY OF HIGH INTENSITY GAMMA RAY SOURCES, by Walter Rosenzweig. [nd] 42p. (BNL-1254)

Various methods for measuring x and gamma rays at high dosage rates are briefly discussed and the ionization-chamber method chosen for further investigation. In view of the high intensities to be measured it is shown that in general ionization-chamber-type dose meters can not be readily applied, the limiting factors being the extremely small electrode spacing required for a chamber to make such a measurement when no external condenser is used, or the leakage problems encountered when an external condenser is employed. A dose-rate meter was designed and after a modification found to produce no spurious responses and to possess satisfactory saturation and energy response characteristics. It is saturated with an electrode potential of 300 volts at an intensity of 10^8 r/hr and the response remains flat within 10% over a range from .04 to 1.2 Mev. Measurements were conducted within hollow cylindrical sources of Ta^{182} and Co^{60} and the intensity distributions compared with a theoretical derivation. The absolute measurements of the dose-rates within the center of some of the sources were compared to measurements made with chemical dosimeters and agreement was found in all cases to within better than 10%. (auth)

6663
Los Alamos Scientific Lab.
AFTER-PULSES IN PHOTOMULTIPLIER TUBES, by James S. Allen. Aug. 1952. 10p. (LA-1459)

In the investigation of the after-pulse phenomenon, the photomultiplier was used as a crude time-of-flight mass spectrometer and some of the ions striking the photocathode were identified. A pulsed light-source tube of known pulse rise time and pulse decay time was used to produce pulses in the evacuated photomultiplier tubes under investigation. The size of the pulses were varied over a wide range. The

pulses from the photomultiplier tubes were displayed on an oscilloscope, the sweep of the scope being triggered by the pulse used to trigger the light tube. After-pulse patterns were obtained for three of the most widely used photomultiplier tubes with subsequent identification of the ions.

6664

Mound Lab.

INSTRUMENTATION AND TECHNIQUES QUARTERLY PROGRESS THROUGH SEPTEMBER 17, 1952, by J. W. Heyd. Sept. 30, 1952. 7p. (MLM-758)

Studies are very briefly reported on the production of quartz-fiber helices; use of lithium borohydride in neutron detectors; anticoincidence techniques for reducing γ background; an automatic, multiple-sample γ analyzer; and grid-controlled rectifiers.

6665

Palmer Physical Lab., Princeton Univ.

THE RESPONSE OF SODIUM IODIDE CRYSTALS TO HIGH ENERGY PROTONS, by J. G. Likely and W. Franzen. [nd] 8p. (NYO-3475)

It was found that the proton energy–pulse height relation for a NaI(Tl) crystal gives, within an experimental uncertainty of approximately 2%, a straight-line plot up to 18 Mev which passes through the origin.

6666

A REMARK ON THE SPACE-CHARGE SHEATH OF THE GEIGER COUNTER. D. H. Wilkinson. Rev. Sci. Instruments 23, 463-4(1952) Sept.

The popular notion of the Geiger counter space-charge sheath as a thin expanding shell is shown to require modification. Owing to the considerable charge transported in the sheath it grows in thickness as it crosses to the cathode and may occupy more than half the total volume of the counter. The attendant wide straggle in arrival time of the positive ions at the cathode may explain, to some degree, the time distribution of spurious counts. (auth)

6667

IRRADIATION AND DEVELOPMENT OF NUCLEAR EMULSIONS EXPOSED TO INTENSE THERMAL NEUTRON FLUXES ACCOMPANIED BY γ RADIATION. H. Faraggi, A. Bonnet, and M. J. Cohen. J. phys. radium 13, 105A-111A(1952) July-Aug.-Sept. Suppl. (In French)

The clouding of nuclear emulsions exposed to strong sources of thermal neutrons or γ rays is caused essentially by the formation of electrons, both those from the radioactivity induced in the AgBr and photoelectrons of diverse origin. The best procedure for obtaining good visibility of the tracks of heavy particles in the midst of this background consists of strongly refrigerating the emulsions, then plunging them for several minutes in a warm hydroquinone-base developer solution. In the case of the Châtillon pile, it is possible under these conditions to measure tracks in emulsions exposed to the full 3×10^{12} neutrons/cm^2 flux.

6668

THE CRYSTAL SCINTILLATION COUNTER AS A NEW DOSE MEASUREMENT TECHNIQUE. R. Glocker and G. Breitling. Strahlentherapie 88, 92-101(1952). (In German)

Dosage determination by the use of a probe containing an organic fluorescent crystal, the scintillations of which are detected by an electron multiplier, is described. The small size of the sensitive element permits measurements in dose fields having great local differences. Experimental response curves are plotted from 0.07 to 1.7 A for naphthalene, phenanthrene, chlorophenanthrene, and 57% phenanthrene–43% chlorophenanthrene detectors. Rules are given for calculating the wave-length dependence of the response for any given chemical composition and thickness. A mixed-crystal counter was constructed, the response in r/sec of which was practically independent of the quality of the radiation.

6669

A NEW RADIATION MEASURING APPARATUS WITH A FLEXIBLE CRYSTAL-DETECTOR PROBE AND ITS CLINICAL APPLICATION. J. Becker, K. E. Scheer, and A. Kübler. Strahlentherapie 88, 34-43(1952). (In German)

An appliance for measuring radiation dosages in tissue, isodose curves, etc., is described. The detector probe contains a $CdSO_4$ crystal, whose conductivity changes under exposure to ionizing radiation are measured. The instrument is particularly qualified for measuring dosages from Ra and other radioactive substances emitting γ radiation. It is of simple construction and easy to handle.

MESONS

6670

Atomic Energy Research Establishment, Harwell, Berks (England)

THE INTERACTION OF NEGATIVE μ-MESONS WITH URANIUM NUCLEI, by W. Galbraith and W. J. Whitehouse. July 24, 1952. 16p. (AERE-N/R-987)

A coincidence experiment is described in which an attempt is made to detect fissions of uranium nuclei resulting from the capture of negative μ-mesons in the cosmic radiation. The result shows that fission is not the most probable process following meson capture, and an upper limit of 0.25 is set for the probability of this fission process occurring. An interpretation of the result is suggested in terms of the nuclear properties of the protactinium isotope Pa^{238}, which is formed in the capture process. It is possible that neutron emission from the nucleus, rather than fission, is the more likely process, when account is taken of the moderate excitation resulting from the charge-exchange reaction of the negative μ meson with the nucleus. On this basis, the experiment is not in disagreement with previous work on this reaction. (auth)

6671

Radiation Lab., Univ. of Calif., Berkeley

PRODUCTION OF NEGATIVE μ MESONS AND THEIR BEHAVIOR IN NUCLEAR RESEARCH EMULSIONS, by Dora F. Sherman. Sept. 8, 1952. 17p. (UCRL-1939)

A beam of μ^- mesons produced inside the tank of the 184-in. cyclotron has been studied. Of these, 3 ± 1 percent formed one-prong stars when stopped in an Ilford C2 emulsion. Two two-prong stars with prong ranges of 2 or 3 microns were observed which appear to be fission-like disintegratinos induced by μ^- capture. 32% of the μ^- mesons have clusters of grains about 1 micron in diameter or two pronglets about one micron long at their termini. These are interpreted as Auger electrons accompanying capture by a heavy nucleus, or in some cases as fission of the capturing nucleus. An upper limit on the cross section for direct production of μ^- mesons, $d\sigma/d\Omega dp$, in the forward direction at pc = 129 Mev, has been evaluated to be 0.015 times the cross section for production of π^- mesons in the same interval. (auth)

6672

PARTICLES WITH MASS INTERMEDIATE BETWEEN MASSES OF MESON AND PROTON. A. Alikhanyan and V. Kharitonov. Doklady Akad. Nauk. S.S.S.R. 85, 295-8(1952) July 11. (In Russian)

Results of absorption and proportional-counter experiments on cosmic-ray varitrons are reported. In several sets of experiments, masses were determined from ranges in Pb for a light particle (520 or 545 m_e) and a heavy particle (940, 955, or 1050 m_e). Masses for the same particles determined from ionization were, respectively, ~400 or 500 ± 40 and 900 ± 55, 940 ± 40, or 1010 ± 120.

METEOROLOGY

6673

Round Hill Field Station, Mass. Inst. of Tech.

FINAL REPORT [ON] RESEARCH ON TURBULENCE AND DIFFUSION OF PARTICULATE MATTER IN THE LOWER LAYERS OF THE ATMOSPHERE [FOR] NOVEMBER 1, 1948–NOVEMBER 30, 1951, by E. Wendell Hewson, H. E. Cramer, G. C. Gill and F. A. Record. [nd] 129p. (NP-4075)

An investigation was made of the turbulent flow of air in which both the mixing-length theory and the statistical theory were investigated. New types of instruments developed for the study include a fast-response instrument to measure rapid turbulent fluctuations of wind speed, wind direction, and temperature. Instrumentation for measuring mean wind speed, mean wind direction, and mean air temperature was developed and installed at six levels on a permanent 144-ft steel tower. A portable 40-ft steel tower which moves on wheels was constructed and similar instrumentation installed at four levels. Sets of grouped field observations were made and each set of data was analyzed intensely by statistical and other means. The development of theoretical concepts resulted in a theoretical model of the process of eddy diffusion in turbulent flow which postulates that diffusion is a direct result of dynamic entrainment of air in a steady state of flow. Included is a summary of the present trends in research on atmospheric turbulence in the boundary layer and recommendations for further research resulting from a symposium on the subject held on June 4, 5, 7, and 8, 1951.

MOLECULAR PROPERTIES

6674

Solid-State and Molecular Theory Group, Mass. Inst. of Tech.

QUARTERLY PROGRESS REPORT NO. 5. July 15, 1952. 92p. (NP-4114; Quarterly Progress No. 5; U-24244)

Progress is reported on the following research: a soluble problem in energy bands, ferromagnetism and the band theory, localized functions in molecules and crystals, molecular orbital calculations for the ClO_4^- ion, the ferromagnetism and molecular-oxygen theories, orthogonalized plane waves and the completeness relation, energy bands in Cr, self-consistent field calculation for Cu^+, Dirac density matrix expressed in terms of Wannier functions, superlattice stability, and magnetic scattering of neutrons. (NRS abst.)

NUCLEAR PHYSICS

6675

Wesleyan Univ.

THE USE OF MASS SPECTROGRAPHY IN THE STUDY OF NUCLEAR SHELL STRUCTURE, by Henry E. Duckworth. Wesleyan Univ. and Hamilton Coll., McMaster Univ. (Canada). [nd] 9p. (AECU-2274)

Recent accurate determinations, by mass and microwave spectrography, of nuclear masses of nuclides with $Z > 21$ have permitted curves of binding energy per nucleon to be plotted against mass number with sufficient accuracy to show the effects of the magic numbers 50, 82, and 126. The maximum in the binding-energy curve occurs at Ni^{62}, which has 28 protons.

6676

NUCLEON RECOIL AND THE ELECTRON-NEUTRON INTERACTION. L. L. Foldy. Phys. Rev. 87, 675-6(1952) Aug. 15.

The nucleon and meson contributions to the charge density operator for the neutron are calculated separately and from this their contributions to the intrinsic electron-neutron interaction can be calculated. Since these values depend on the ratio of meson to nucleon mass μ/M, they have been calculated as a function of this parameter and the results plotted. The nucleon recoil effect in some ways explains the unexpected smallness of the intrinsic interaction.

6677

BETA TRANSFORMATION ENERGIES, MAGIC NUMBERS, AND THE MISSING ELEMENTS 43, TECHNETIUM, AND 61, PROMETHIUM. Hans E. Suess and J. Hans D. Jensen. Arkiv Fysik 3, 577-84(1952). (In German)

Effects of nucleon pairing and magic numbers on the energies of odd-odd β transitions are discussed, and the absence from nature of Tc and Pm is explained.

NUCLEAR PROPERTIES

6678

Argonne National Lab.

SOME COMMENTS ON THE FISSION TO CAPTURE CROSS SECTION RATIO, by John R. Huizenga. June 1592. Decl. Sept. 23, 1952. 7p. (AECD-3437; ANL-4857)

An attempt is made to correlate the thermal neutron fission cross sections of various nuclides. An empirical relationship is observed when the logs of the ratios [thermal neutron fission cross section of (Z,A)/thermal neutron capture cross section of (Z,A)] for several nuclides are plotted against their neutron binding energies [binding energy of a neutron to (Z,A)]. The log of the σ_f/σ_c ratio decreases markedly with decreasing neutron binding energy. (auth)

6679

Chalk River Project (Canada)

THEORY OF NUCLEAR MAGNETIC MOMENTS, by A. K. Kerman. Sept. 1952. 37p. (LT-35)

An interpretation of the observed values of nuclear magnetic moments is given. Emphasis is on those features of the nuclear models which tend to explain the magnetic moments rather than on the details of the models. The shell model of the nucleus is first discussed with proposed modifications to explain the fact that the experimental magnetic moments do not fit quantitatively the exact shell model predictions. Then more drastic modifications are introduced to explain the large nuclear quadrupole moments and the effect of these modifications on the magnetic moments. Finally, a detailed investigation is given of the light, conjugate nuclei.

6680

Mallinckrodt Chemical Lab., Harvard Univ.

CORRELATION OF Cl^{35} NUCLEAR QUADRUPOLE COUPLING FREQUENCIES WITH HAMMETT'S SIGMA, by Harlan C. Meal. [nd] 7p. (NP-4077)

Dean and Pound (J. Chem. Phys. 20, 195(1952)) measured the nuclear quadrupole resonance frequency of Cl^{35} for some chlorobenzene derivatives by means of a frequency-modulated super-regenerative spectrometer. The author has observed signals, too weak to be detected with frequency modulation and oscilloscope display, by using magnetic-field modulation, phase-sensitive detection, and pen recording. Temperature dependences of these frequencies and those of Dean and Pound were extrapolated to absolute zero and plotted against Hammett's substituent parameter σ (PHYSICAL ORGANIC CHEMISTRY, N. Y., McGraw-Hill Book Co., Inc., 1940. Chap. VII).

6681

Palmer Physical Lab., Princeton Univ.

EXCITED STATES OF LITHIUM-6 AND LITHIUM-7, by W. Franzen and J. G. Likely. [nd] 8p. (NYO-3479)

This report was published in Phys. Rev. 87, 667-8(1952). An abstract was issued as report NYO-3008 and appears in Nuclear Science Abstracts as NSA 6-3673.

6682

THE EFFECT OF A FINITE NUCLEUS ON BETA-DECAY. I. Malcolm. Phil. Mag. (7) 43, 1011-27(1952) Oct.

Relativistic wave functions are derived for the electron in a potential field which is constant within the nucleus and coulombian outside. The relative values of the cut-off wave functions and the pure coulomb wave functions are calculated both for the discrete and continuous spectrum. The changes thereby produced in the probability of orbital-electron capture, in the continuous beta spectrum and in the ratio of probabilities of K capture to positron emission are examined. It is concluded that for the heavier nuclei the probability of K capture and the ratio of the probabilities of K capture to positron emission are appreciably affected. The modifications produced in the continuous spectrum are greatest for spin change equal to n where $n(n > 1)$ is the degree of forbiddenness of the transition. In this case the coefficients of the squares and products of matrix elements given in the correction factors of Konopinski and Uhlenbeck are appreciably changed. Therefore for given values of the matrix elements the spectrum is modified. (auth)

6683

THE NUCLEAR SPIN AND MAGNETIC MOMENT OF $_{55}Cs^{134}$. V. Jaccarino, B. Bederson, and H. H. Stroke. Phys. Rev. 87, 676-7(1952) Aug. 15.

The nuclear spin and magnetic moment of Cs^{134} was obtained by the atomic-beam magnetic resonance method. A nuclear spin value ($\Delta\nu^{134}$) of 10,465 ± 12 Mc and a magnetic moment value (μ) of 2.96 ± 0.01 n.m. were found.

6684

NUCLEAR MAGNETIC RESONANCE LINES OF ANTIMONY IN ANTIMONY HEXAFLUORIDE ION. S. S. Dharmatti and H. E. Weaver, Jr. Phys. Rev. 87, 675(1952) Aug. 15.

A sensitive spectrometer has been used in examining the nuclear magnetic resonance of Sb^{121} in SbF_6. The Sb^{121} absorption line clearly indicates that the resonance has seven components. This seems to indicate that the coupling mechanism of the SbF_6 ion is not direct dipole coupling.

NUCLEAR REACTORS

6685

Lewis Flight Propulsion Lab., NACA

LUMPED REFLECTOR PARAMETERS FOR TWO-GROUP REACTOR CALCULATIONS, by Daniel Fieno, Harold Schneider, and Robert B. Spooner. Sept. 26, 1952. 25p. (NACA-RM-E52H01)

Equations are developed to show that, for one-dimensional two-group neutron-distribution calculations, the properties of a neutron-reflector region can be combined in three parameters that effectively represent the action of the reflector. The use of these parameters and boundary conditions based on them for single and multizone reflectors is considered and from the results of computations, the following applications of the parameters are shown: (1) Use of the parameters in connection with reactor core properties for comparison of reflector configurations, (2) direct use of parameters as circuit constants in electrical analog, and (3) use of boundary conditions based on reflector parameters to obtain numerical solutions of two-group equations in a neutron-producing region. (auth)

NUCLEAR TRANSFORMATION

6686

Washington Univ., St. Louis

ANGULAR CORRELATIONS IN (d,p-γ) REACTIONS, by L. J. Gallaher and W. B. Cheston. [nd] 15p. (AECU-2273)

The (d,pγ) reaction has been analyzed assuming that a stripping mechanism is operative. It is shown that if the neutron captured from the deuteron is characterized by a single value of orbital angular momentum, l_n, the γ ray is correlated to the nucleus recoiling from the (d,p) reaction just as if the neutron had been captured from a free state independent of a specific nuclear model. Only in the two special cases of a spin-zero target nucleus and a spin-zero recoil nucleus, is it rigorously true that only one value of l_n contributes to the absorption process. Thus, it is only in these two cases that statements concerning the angular correlation function for (d,pγ) reactions can be made independent of a nuclear model. As a specific example, the correlation function is given for the γ ray emitted by the 1.34-Mev excited state of A^{41} in a transition to the ground state via the reaction A^{40} (d,p) $A^{41*}(\gamma)A^{41}$. (auth)

6687

(n,α) REACTIONS INDUCED BY SLOW NEUTRONS ON THE SEPARATED ISOTOPES OF ZINC AND ON NICKEL. Henriette Faraggi, René Bernas, and Arlette Bonnet. Compt. rend. 235, 425-7(1952) Aug. 11. (In French)

The Zn isotopes, concentrated to 75%, were deposited on Ni and placed in contact with Ilford C2 emulsions 50 μ thick. The ensemble was then exposed in the Châtillon pile to a total flux of 7.5×10^{11} neutrons/cm^2. Track-length distribution of the resulting α particles showed a cross section of 5.5×10^{-30} cm^2 for the Zn^{67}(n,α)Ni^{64} reaction, the α particles having a mean energy of 7.5 Mev. The cross sections for the (n,α) reactions of Zn^{66} and Zn^{68} were $< 2 \times 10^{-29}$ cm^2. The (n,α) cross section for natural Ni was $< 2 \times 10^{-30}$ cm^2.

PARTICLE ACCELERATORS

6688

Atomic Energy Research Establishment, Harwell, Berks (England)

EFFECT OF CORRUGATION PITCH ON PERFORMANCE OF M.R.C. LINEAR ACCELERATOR, by W. Walkinshaw and M. Ross. Jan. 1952. 10p. (AERE-T/M-55)

The voltage of the electrons from the M.R.C. linear accelerator is lower than expected because the series impedance of the guide is low. The expected attenuation of the guide is approximately equal to that found in practice because of a number of factors which cancel each other. It is suggested that in future guide design an estimate of its voltage can still be obtained by the relatively simple Cutler approximation provided the loss in the cylindrical wall and the finite wall thickness is taken into account. This would give guide attenuation greater than that found in measurement but this would allow for the decreased series impedance of the guide. (auth)

6689

Oak Ridge National Lab.

MEASUREMENT OF BEAM ENERGY AND ENERGY DISTRIBUTION ON AN INTERNAL CYCLOTRON TARGET, by B. L. Cohen. July 1952. 12p. (ORNL-1347)

The energy and energy distribution of protons striking an internal target on the 86-in. cyclotron was measured by two methods: (1) measuring density on a photographic film placed behind a stepped aluminum absorber; and (2) measuring the excitation function for the (p,n) reaction on copper. Details of the methods and typical results are given. The energy was found to be sensitive, within several hundred kilovolts, to various cyclotron parameters. (auth)

6690

X-RAY MEASUREMENT OF THE CYCLOTRON rf DEE VOLTAGE. Francis H. Harlow. Rev. Sci. Instruments 23, 501(1952) Sept.

A method is given for the determination of the peak dee-to-ground voltage in a cyclotron by measuring the maximum energy of the x rays coming from the tank while the oscillator is running. The value thus determined agrees with the voltage as calculated from the limiting radius of a beam as a function of dee voltage.

6691

ACCELERATION OF BERYLLIUM AND CARBON IONS IN A SYNCHROCYCLOTRON. C. N. Chou, W. F. Fry, and J. J. Lord. Phys. Rev. 87, 671-2(1952) Aug. 15.

By adjusting the upper frequency limit of the oscillator and the magnetic field of the University of Chicago synchrocyclotron, normal H_2^+ ion acceleration near the center was eliminated. However C^{+5} ions and Be^{+4} nuclei could be accelerated. C ions of energies as high as 1.1 bev were observed in photographic plates. A study of the δ rays along the C and Be tracks revealed that the number of δ rays varies directly with the atomic number Z.

RADIATION ABSORPTION AND SCATTERING

6692

Los Alamos Scientific Lab.

SEMI-EMPIRICAL EQUATIONS FOR THE SPECTRAL ENERGY DISTRIBUTION IN X-RAY BEAMS, by C. Robert Emigh and Lawrence R. Megill. Oct. 7, 1952. 29p. (AECU-2260; LADC-1244)

A method is described for obtaining the distribution of energy in an x-ray beam as a function of wavelength. This method consists in essentially analyzing filtration data in terms of Laplace transforms and thus obtaining the energy distribution in terms of a sum of the corresponding inverse Laplace transforms. Using this method, theoretical considerations are employed in choosing transforms which can be easily fitted to most x-ray filtration data, thereby providing semi-empirical equations for the spectral distribution. The use of a NaI(Tl) crystal as a filtration spectrometer is described. (auth)

6693

Brookhaven National Lab.

T TRACKS IN NUCLEAR EMULSIONS, by M. Blau and E. O. Salant. [nd] 7p. (BNL-1263)

Black tracks with their last grain crossed by a straight thin track, the last grain corresponding to the end of travel of a heavily ionizing particle, have been found in emulsions flown for 5 hrs at 15 g/cm^2 and geomagnetic latitude 41°N. These black tracks have been designated T tracks and the heavily ionizing particles, T particles. In ~46 cm^2, examination of 2583 black tracks revealed 11 T tracks. Preliminary investigations indicate that T tracks are due to physical events instead of chance coincidence. The original particle is presumed to break up into two fast singly charged particles either by decay or annihilation.

6694

Palmer Physical Lab., Princeton Univ.

THE SCATTERING OF PROTONS BY HYDROGEN NEAR 18 MEV, by J. L. Yntema and M. G. White. May 15, 1952. 50p. (NYO-3478)

The differential cross section for the scattering of protons by protons at 18.3 Mev has been measured over the range 90 to 30° in the center-of-mass system. Hydrocarbon foils of accurately known composition have been used as targets. The protons scattered by hydrogen were detected by observing coincidences between the scattered and recoil protons. Because of slit edge penetration effects and geometrical considerations it was necessary to construct a scattering chamber of large diameter. The 60-in. scattering chamber is described in detail. The scattered protons were detected by anthracene crystals. The coincidence circuit was of the shorted line type and had a resolving time of about 0.05 μsec. The energy was determined by measuring the range in aluminum using the corrected range-energy relation. The absolute probable error at 90° is estimated at about 1%. The relative probable error varies from about 0.5% at 90° to about 1% at 30°. The data cannot be interpreted using S-wave scattering alone. A repulsive P-wave does not give the best fit to the experimental data. It is shown that a D-wave phase shift from 0.3 to 0.5° combined with an attractive P-wave phase shift from 0 to 2° does give an acceptable fit. The magnitude of the S-wave phase shift is consistent with the assumption of an exponential or Yukawa potential. The experimental points have been compared with the model proposed by Christian and Noyes. It is shown that the square-well potential for the singlet interaction is not in agreement with the experiment. If one uses a gauss-error potential in the singlet interaction the triplet tensor interaction does give a satisfactory fit. (auth)

6695

Radiation Lab., Univ. of Calif., Berkeley

INTERPRETATION OF HIGH ENERGY p-p SCATTERING (thesis), by Don R. Swanson. May 29, 1952. 57p. (UCRL-1841)

A study is made of the scattering of high-energy protons by protons. Several types of "cutoffs" are introduced into the singular tensor interaction proposed by Christian and Noyes; the triplet P state radial equations are then solved by essentially exact numerical integration methods. The resulting cross sections show a more pronounced disagreement with experiment than do the Born approximation cross sections of Christian and Noyes. Calculations are carried out in the vicinity of 350 and 120 Mev. (auth)

6696

Radiation Lab., Univ. of Calif., Berkeley

THE RANGE CORRECTION FOR ELECTRON PICKUP, by Walter H. Barkas. Aug. 29, 1952. 11p. (UCRL-1937)

An extension of positive-particle ranges caused by pickup of electrons at low velocities has been studied in Ilford C2 emulsions. Ranges of Li^8 and B^8 nuclei were measured in emulsion and compared with tracks of helium and hydrogen isotopes of the same velocity. The empirical range-energy relation adduced for light nuclei is $Z^2R/M = F(T/M) + 0.46Z^2 + 0.0063\,Z^4$, where M is the atomic weight of the ion, R is its residual range in microns, T is the K.E. of the ion in Mev, and the function F(T/M) is determined, for a particular emulsion, from the range-energy curve of any light nucleus.

6697

Radiation Lab., Univ. of Calif., Berkeley

SUMMARY OF THE RESEARCH PROGRESS MEETING OF AUGUST 7, 1952, by Sergey Shewchuck. Sept. 18, 1952. 4p. (UCRL-1953)

I. Scintillating Crystal Gamma Counter. K. D. Jenkins. An abstract of the thesis report UCRL-1766 of the same title and author is quoted. II. Analysis of Elastic d-p Scattering Experiments at 190 Mev. Martin Stern. Analysis can be made of scattering in the forward direction by use of either impulse approximation or Born approximation. The elastic d-p scattering differential cross section can be written in two factors. The first of these depends on the momentum transfer to the deuteron and is called the "sticking factor." The second factor involves only the scattering amplitudes in n-p and p-p scattering.

6698

CALCULATED X-RAY MASS ABSORPTION COEFFICIENTS OF GLASS COMPONENTS. Gordon F. Brewster. J. Am. Ceram. Soc. 35, 194-7(1952) Aug.

X-ray mass absorption coefficients of some elements and oxides used in glassmaking have been computed from 0.01 A (1234 kv) to characteristic K absorption edges. Using these values, the absorption of x rays by a glass in the wave-length range considered can be readily calculated from its composition expressed in weight fractions of oxide components and its density. (auth)

6699

IONIZATION AT RELATIVISTIC ENERGIES AND POLARI-

ZATION EFFECTS. M. Huybrechts and M. Schönberg. Nuovo cimento (9) 9, 764-807(1952) Sept. (In English)

A theory of the polarization effects in the energy loss of a charged particle is given, in which the mechanism of the loss is different from that of the Fermi theory. This theory leads to a distribution of the loss between ionization-excitation and emission of Cherenkov radiation which differs considerably from that of the theories on Fermi's lines, although the stopping power is not essentially changed, being somewhat less than in those theories. This treatment leads to an increase of the direct ionization at impact parameters larger than atomic dimensions after the relativistic minimum, the increase being large in the case of gases. The Fermi saturation effect of the loss at distances larger than atomic dimensions does also exist in the present theory, although due to a different mechanism. The relativistic increase of the loss in distant interactions is due largely to an increase of the radii of action for ionization and excitation (Bohr-Williams mechanism), but there is also a contribution of the Cherenkov radiation (Fermi mechanism). The saturation arises from a limitation of the increase of the radii of action due to the polarization of the medium and to the saturation of the emission of Cherenkov radiation. This theory leads to a modification of the formula of Frank and Tamm for the rate of emission of Cherenkov radiation, the emission of high-energy Cherenkov radiation being considerably reduced. (auth)

6700

NONLOCALIZABLE INTERACTIONS; EXEMPLIFIED BY THE COMPTON EFFECT. R. Ascoli. Nuovo cimento (9) 9, 757-63(1952) Sept. (In Italian)

A method proposed by G. Wataghin (NSA 6-5004) to introduce the idea of nonlocal interactions into field theory is developed. The invariants on which depend the cut-off factors arising in application of the method are determined, expressions being derived by which such invariants can be calculated. As an example the method has been applied to the Compton effect.

6701

INTENSITY MEASUREMENT OF CERENKOV LIGHT. P. Bassi, A. M. Bianchi, and C. Manduchi. Nuovo cimento (9) 9, 861-3(1952) Sept. (In English)

First measurements with an apparatus intended to study the intensity of Cherenkov radiation as a function of energy of the incident cosmic particle are reported. The equipment consists of four trays of G-M counters in coincidence and a cylindrical Plexiglas Cherenkov-radiation detector coated with MgO. For high-momentum particles the data obtained do not agree with the theory that the intensity is proportional to $1-1/n^2\beta^2$; the divergence is not caused by knock-on electrons, fluorescence, or geometry and may indicate a new method of measuring high energies.

6702

THE INELASTIC SCATTERING OF FAST NEUTRONS. M. J. Pole. Phil. Mag. (7) 43, 1060-9(1952) Oct.

An anthracene scintillation counter has been used as a spectrometer to measure the energy distribution of initially monokinetic neutrons scattered from Fe and Al. In each case discrete groups of neutrons with reduced energy were found, showing that the scattering nucleus was being raised to its excited states. The differential cross section for scattering through 97° has been measured for the various processes. (auth)

6703

GAMMA-RAY YIELD FROM THE PROTON BOMBARDMENT OF BORON. L. W. Cochran, J. L. Ryan, H. H. Givin, B. D. Kern, and T. M. Hahn. Phys. Rev. 87, 672-3 (1952) Aug. 15.

Measurements were made of the γ-ray yield, in the forward direction, resulting from the proton bombardment of B in the 130-kev to 1-Mev energy region. Both thick-target and thin-target γ-ray yields are determined and the plots indicate resonances in the 600 to 630-kev region.

6704

MEASUREMENT OF THE HALF-VALUE-THICKNESS FOR OIL-INSULATED X-RAY TUBES. E. Zieler. Z. angew. Physik 4, 293-7(1952) Aug. (In German)

Measurement with an ionization chamber of quality of high-voltage (200-kv) x rays from oil-insulated tubes in terms of the Cu half-value-thickness is described, and effects of Compton scattering are considered. The radiation scattered from the insulating oil and window is shown to be harder than the primary beam.

RADIATION EFFECTS

6705

Purdue Research Foundation

PROGRESS REPORT [ON] IRRADIATION OF MATERIALS WITH CHARGED PARTICLES FROM THE PURDUE CYCLOTRON. June 1, 1952. 69p. (AECU-2225)

The electrical properties of Ge, Si, and Mo were investigated as a function of irradiation and it was found that both hole trap and electron trap are produced by irradiation with fast particles. In the case of Ge it was found possible to establish the existence of hole traps, and to confirm qualitatively the model which indicates that the Fermi level, upon irradiation, shifts near the full band and finally determines the resistivity of the metal. The use of an extensometer for the measurement of stress-strain curves and of creep is reported. Measurements were made of creep, Young's modulus, and yield strength of fine Cu wires.

6706

Purdue Research Foundation

SPECIAL REPORT [ON] PRODUCTION OF LATTICE DEFECTS IN GERMANIUM BY ELECTRON BOMBARDMENT, by Everett Earl Klontz. June 1952. 75p. (AECU-2267)

High-energy electrons have been used to produce two types of effects in N-type Ge. Intense ionization effects having lifetimes of about 10 microseconds have been found while observing conductivity changes during bombardment with 300-kv pulsed electrons from the Purdue Van de Graaff. Single crystals exposed to electrons of over 0.6 Mev from various Van de Graaff generators exhibit permanent changes due to lattice defects produced. Calculations based on estimates by Mill (classical relativistic theory) indicate a threshold for incident electrons of about 0.6 Mev for the permanent effect for Ge. Experimental procedures established the threshold at 0.63 Mev corresponding to a minimum recoil energy (Wigner energy) of 30 ev for the Ge atoms. Mott's theory provides a basis for determining the probability of observing permanent changes and allows an estimate of the magnitude of currents required. Following a procedure outlined by Lark-Horovitz, preliminary results were obtained indicating changes in Ge from N-type to P-type. Probing of the samples thus indicated similar effects for electron bombardment as for irradiation by heavy particles. For energies near the threshold at bombarding temperature 77°K, only about two carriers in the sample are effectively removed for 10^4 electrons incident on the sample. At higher energies, the cross section for the process is much larger and indicates removal of up to one carrier in the irradiated volume for each 10 electrons incident at 1.8 Mev. The degree of damage produced by bombardment is a function of the energy, flux, and temperature of bombardment. Conductivity-flux curves for several bombardment energies and temperatures are shown. Heat treating the samples heals out bombardment-produced defects. The extent of healing has been followed by taking Hall and resistivity values as a function of temperature, and depends on the temperature to

which the sample is heated. Restoration of the original resistivity can be attained by heat treatment at 450°C for 24 hr, again in agreement with the results after quenching and nucleon bombardment. (auth)

6707
Brookhaven National Lab.
IRRADIATION OF LIQUID AMMONIA, by Ralph Roberts and Augustine O. Allen. [nd] 5p. (BNL-1262)

Liquid NH_3 was irradiated in an electrostatic generator, constructed by the High Voltage Engineering Corporation, by 2-Mev cathode rays and 2-Mev x rays. No evidence was found for the formation of stabilized free electrons during the irradiation.

6708
ULTRAVIOLET PHOTOGENESIS IN FUSED SILICA BOMBARDED WITH POLONIUM α PARTICLES. R. H. Busso and M. Lautout. J. chem. phys. 49, 513-14(1952) Sept. In French)

Previous studies with CuI photodetectors on the ultraviolet emission by α-bombarded 32-μ-thick films of H_2O supported on fused-quartz plates suggested study of the role played by the quartz in this process. By measuring the ultraviolet radiation emitted by a quartz plate exposed at distances of 0 to 20 cm to a 20,000-esu Po source, at various air pressures and in vacuum, it was found that the quartz produced 10^{-4} to 10^{-3} photons per α particles.

RADIOACTIVITY

6709
Argonne National Lab.
EXPERIMENTAL ENERGY AND ANGULAR DISTRIBUTIONS OF INNER BREMSSTRAHLUNG, by T. B. Novey. Sept. 5, 1952. 30p. (AECU-2257; UAC-641)

The spectra of the continuous radiation or inner bremsstrahlung emitted in the β decay of P^{32} and RaE (Bi^{210}) have been measured in the region 20 to 250 kev with a NaI scintillation spectrometer. Comparison of the spectra on an absolute basis with the prediction of the theory shows good agreement. The angular correlation of the radiation with the emitting β particles also was measured. The results are in excellent agreement with theoretical predictions. (auth)

6710
Argonne National Lab.
THE RADIATIONS OF Th^{231} (UY), by M. S. Freedman, A. H. Jaffey, F. Wagner, Jr., and J. May. July 1952. 24p. (ANL-4865)

β-ray spectrum studies on a double-lens spectrometer of the electron spectrum of UY revealed a complex spectrum with three beta components of 302 kev (44%), 216 kev (11%), and 94 kev (45%), and numerous conversion lines assignable to gammas of 22, 59, 63, 85, 122, 167, and 208 kev, each of these except the 122 kev also observed directly as gammas in a scintillation spectrometer. There is also evidence for a 107 and for a 230-kev gamma ray. The samples were separated carrier-free from isotopically pure U^{235} (99.86%) by solvent extraction. A decay scheme is presented which gives a total disintegration energy at 324 kev. (auth)

6711
Naval Research Lab.
ON THE NATURAL RADIOACTIVITY IN THE AIR, by Irving H. Blifford, Luther B. Lockhart, Jr. and Herbert B. Rosenstock. Sept. 16, 1952. 11p. (NRL-4036)

The concentrations of the various radiaoctive decay products of radium in the air have been determined by observing the beta activity of pieces of filter paper through which air has been passed, and of chemically separated isotopes obtained from such filter papers. The relative amounts of long-lived and short-lived products found indicate that besides the radioactive decay of the substances, some other process which removes radioactive particles from the air is active. The mean life of the particles with respect to this other removing process is found to be about ten days. The hypothesis that this process is the capture of the radioactive particles by rain droplets (clouds) is consistent with measurements made of the radioactive content of rainwater. On the other hand, the removal of the ionized radioactive particles by the electric field of the earth leads to a much smaller effect. (NRL abst.)

6712
NATURAL RADIOACTIVITY OF LANTHANUM-138. George I. Mulholland and Truman P. Kohman. Phys. Rev. 87, 681-2(1952) Aug. 15.

Beta particles and x rays from chemically purfied La_2O_3 were found by means of a large proportional counter. These would comprise the natural radioactivity of La^{138} since, presumably, La^{138} decays by electron-capture to Ba^{138} and by β emission to Ce^{138}. An Al absorption curve was obtained. An analysis of the curve is given and compared with one of Tl^{204}. A half life of 7×10^{12} yr was calculated.

6713
THE DECAY OF Am^{241}. J. K. Beling, J. O. Newton, and B. Rose. Phys. Rev. 87, 670-1(1952) Aug. 15.

Studies of the low-energy γ rays and L rays from the decay of Am^{241} have been made. Coincidence measurements, using a resolving time of 2 μsec between the 59.7-kev γ rays detected in a NaI crystal and the other radiation detected in a proportional counter, showed that $6 \pm 0.8\%$ of the radiation in the three low-energy groups was coincident and that an upper limit of 3.6% could be set to the amount of coincident 26.3-kev radiation. A decay scheme for Am^{241} is proposed.

6714
THE NATURAL RADIOACTIVITY OF RUBIDIUM. G. M. Lewis. Phil. Mag. (7) 43, 1070-4(1952) Oct.

The radioactive decay of Rb^{87} has been studied using the scintillations from a crystal of rubidium iodide activated with thallium, some fluorescent properties of which are described. This method, free from source absorption and scattering troubles, indicates a β spectrum with an end point of 275 kev. The Fermi plot gave a forbidden shape, for the most part close to that given by recent proportional counter work using 2π geometry, but having slightly more counts at the high-energy end, and fewer at the low-energy end; the half life has been determined at $5.90 \pm 0.3 \times 10^{10}$ years. The theoretical interpretations are indicated. (auth)

6715
CONTRIBUTION OF NUCLEAR RADIATION TO THE CONTINUOUS γ SPECTRUM ACCOMPANYING β RADIOACTIVITY. J. Horowitz. J. phys. radium 13, 429-30(1952) July-Aug.-Sept. (In French)

Although for permitted β transitions the contribution of an excited initial nucleus to the continuous γ emission is negligible, this is not necessarily true for forbidden β disintegrations. A significant contribution from this source is indicated by consideration of the matrix element for electric dipole radiation. Experimental verification is shown to be possible.

6716
THE DECAY OF Kr^{87}. Sigvard Thulin. Phys. Rev. 87, 684(1952) Aug. 15.

The decay of 78-min Kr^{87} was studied by means of a beta spectrometer. The spectrum shows the presence of a pronounced photopeak of a γ ray of energy 405 ± 20 kev. A tentative decay scheme is given in terms of a Fermi plot showing the presence of two β components of energies 3.63 ± 0.07 and 1.27 ± 0.1 Mev, with relative intensities 75% and 25%, respectively.

6717

NOTE ON THE DEPARTURE FACTOR IN α-DECAY. S. G. Nordström. Arkiv Fysik 3, 547-8(1952). (In English)

The Gamow formula for α decay is valid only for even-even nuclides, the nuclides containing an odd neutron or proton (or both) showing prohibited decay. This is interpreted, not as caused by the requirement that the odd nucleon must be a component of the emitted particle, but as rearrangement of the remaining proton pairs and neutron pairs to a lowest energy state, leaving the odd nucleon (or nucleons) in an excited state, i.e., in the previous quantum state, which it will leave by radiating γ quanta. The probability of this deexcitation will generally be smaller than unity, which causes the α decay to be delayed. The "departure factor" is the inverse of this probability. An attempt is made to classify the deexcitation processes according to their degree of forbiddenness through direct comparison of the departure factor values.

6718

THE AVERAGE ENERGY OF Sr^{90}—Y^{90} AS A FUNCTION OF ABSORBER. Robert H. Goeckermann and Walter H. Seitzer. J. Chem. Phys. 20, 1655(1952) Oct.

The average β-ray energy of an equilibrium mixture of Sr^{90} and Y^{90} as a function of Al absorber was determined. The variation in average β-ray energy was determined by measuring the spectrum using Al foil absorbers. The average energy $\bar{E}$ was calculated from the ratio $\bar{E} = \int_0^{E_{max}} N_E E dE / \int_0^{E_{max}} N_E dE$. The values of the integrals were obtained graphically.

6719

MEASUREMENT OF THE RADIOACTIVITY OF THE WATERS OF LAVEY. E. Binggeli and Ch. Haenny. Bull. soc. vaudoise sci. nat. 65, 253-64(1952) June 15. (In French)

The Rn evolved on boiling the waters from the hot springs of Lavey-les-Bains, Vaud, Switzerland, was measured with an electroscope. The average activity, 6.1 mμc/l, is second in Switzerland only to the springs of St. Placidus, Disentis (17.3 mμc/l). Radioactivities of other Swiss springs are tabulated.

RARE EARTHS AND RARE-EARTH COMPOUNDS

6720

Carnegie Inst. of Tech.

NATURAL RADIOACTIVITY OF LANTHANUM AND NEODYMIUM (thesis), by George I. Mulholland. May 31, 1952. 94p. (NYO-3228)

A search was made for natural activity of neodymium and lanthanum using a proportional counter of large surface area and 50% geometry. The background was reduced by means of massive shielding and guard counters connected in anticoincidence. Normal analytical and radiochemical techniques and repeated ion exchange column separations were used to obtain pure samples. Ten grams of lanthanum oxide gave a counting rate of 54.0 ± 0.6 cpm when spread over an area of 1650 cm^2. Analysis of an Al absorption curve yielded a specific activity for β radiation of 0.07 disint./sec per gram of La and a partial half life of 1.2×10^{12} years for La^{138}. The maximum energy of the β particles, believed to be negative, is estimated to be 1.0 ± 0.2 Mev. The x radiation associated with electron-capture decay to Ba^{138} was also measured. This gave a specific activity of 1.0 x rays/sec per gram of La, corresponding to an electron-capture specific activity of 1.2 disint./sec per gram of La and an electron-capture partial half life of 7×10^{10} years for La^{138}. The net half life is essentially that of electron capture. The $\log_{10}$ ft for the negatron transition is 21.3, which seems consistent with a fourth-forbidden transition from La^{138} in a $g_{7/2}$-$d_{3/2}$ configuration with spin 5 and even parity. At most 1 cpm of soft or hard radiation was observed from 15 grams of Nd oxide spread over an area of 1650 cm^2, whereas from the results of Libby (1934) about 270 cpm would be expected. The maximum specific hard β activity is 0.003 disint./sec per gram of Nd, corresponding to a minimum half life of 2×10^{15} years for Nd^{150}. Reasons are given for supposing Nd^{150} to be unstable but with a very long half life. The maximum specific α activity is 0.02 disintegrations per second per gram of neodymium. (auth)

SPECTROSCOPY

6721

Argonne National Lab.

SPECTROSCOPIC ASSAY OF LITHIUM ISOTOPES, by James K. Brody, Mark Fred, and Frank S. Tomkins. Sept. 12, 1952. 29p. (AECU-2270; UAC-643)

The new Argonne spectroscopy laboratory includes a 30-foot Paschen mounting utilizing either plates or photocells. Construction details are presented of noteworthy items, e.g., the interchangeable fixed slits, grating holders, and source optical benches. For photoelectric detection, the exit-slit assembly is pulled along the continuous plate rail by a selsyn drive. Optimum masking of the grating was established by scanning Hg^{198} lines. This spectrograph has been applied to lithium isotope assay. The fourth order of λ6707 was scanned while the output of a fixed photocell at the second order of the same line served as internal standard. Both outputs were fed to a ratio recorder. The source was a liquid air-cooled hollow cathode tube with the sample deposited only on the bottom of the cathode. The correction for self-absorption was established by measuring the doublet intensity ratio for pure Li^7 as a function of overall intensity, making use of the correction for spurious background indicated by Hg^{198} lines. It was hoped that these two corrections would yield an intensity ratio for mixed isotopes equal to the abundance ratio, but a trend of intensity ratio vs. intensity still remained, due possibly to differential volatilization. The limiting value of this trend gave the expected ratio, with a probable error for replicate determinations of 0.4%. (auth)

6722

NUCLEAR ELECTRIC QUADRUPOLE SPECTRA IN SOLIDS. R. Bersohn. J. Chem. Phys. 20, 1505-15(1952) Oct.

Recent experiments have demonstrated the feasibility of observing nuclear electric quadrupole interactions of widely varying magnitudes in solids. While these effects can often be observed in powdered samples, the most complete information is obtainable from the Zeeman pattern of a single crystal. To facilitate interpretation of these experiments, the nuclear spin energy levels are derived for different relative magnitudes of quadrupole interaction and external magnetic field. Besides the knowledge of the gradient of the electric field tensor, in principle, low-frequency molecular rotation should be detectable by means of the quadrupole spectra. (auth)

THEORETICAL PHYSICS

6723

Atomic Energy Research Establishment, Harwell, Berks (England)

THE TRANSPORT THEORY OF A POINT SOURCE OF NEUTRONS ON THE FREE SURFACE OF A HALF SPACE, by J. P. Elliott. 1952. 22p. (AERE T/R-972)

An isotropic point source is situated in the free surface of a half space. Using the Weiner-Hopf method, a formal expression for the neutron density is obtained involving three successive numerical integrations. In the case when the half space is non-capturing, simple asymptotic expressions at large distances from the source are obtained for both the neutron density and the neutron current density

at the free surface. Approximate results are given in the case of small capture in the half-space. (auth)

6724
A NEW WAVE EQUATION FOR A SPIN-½ PARTICLE. P. Caldirola and P. Gulmanelli. Nuovo cimento (9) 9, 834-45(1952) Sept. (In Italian)

The results obtained by a new wave equation for a spin-½ particle, recently proposed by Corben (NSA 6-5242) in an unitary field theory, are compared with those arising from the ordinary Dirac equation. In particular, the problem of the fine structure for hydrogen-like atom levels is considered and the relation between the magnetic moment and the nature of the particle mass is examined. (auth)

URANIUM AND URANIUM COMPOUNDS

6725
Sylvania Electric Products, Inc.
A METHOD FOR THE QUANTITATIVE DETERMINATION OF PREFERRED ORIENTATION, by J. H. Bach and J. B. Burnham, Jr. Sylvania Electric Products, Inc. and Philipps Oil Co. [nd] Decl. with deletions Oct. 23, 1952. 20p. (AECD-3450)

A method for the rapid determination of textures in worked U rods is described. Since the high x-ray absorption coefficient of U prohibits the use of standard film methods, an x-ray spectrometer technique was employed in which only those x rays diffracted by surface crystallities of the sample are reflected into the G-M tube. The described method is very sensitive to grain size, and its advantage is that pertinent textures can be rapidly established. The method is, however, less precise than a pole figure procedure, and an accuracy of better than 15 to 20% is not claimed.

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NEW NUCLEAR DATA

Summary of New Nuclear Data on Half Lives, Radiations, Relative Isotopic Abundances, Nuclear Moments, Neutron Cross Sections, Reaction Energies, and Masses

Prepared by National Bureau of Standards Nuclear Data Group with the Assistance of Readers

For a list of the abbreviations used in this section, see NSA, Vol. 6, No. 18B, page "SUPPLEMENT 1".

$_{29}Cu^{63}_{34}$	$q(Cu^{63})/q(Cu^{65}) = 1.0806$ I	H. Krüger, U. Meyer-Berkhout, Z. Physik 132, 171 (1952); Naturwiss. 38, 121(1951).
$_{33}As^{75}_{42}$	μ 1.44 I	H. Krüger, U. Meyer-Berkhout, Z. Physik 132, 221 (1952).
$_{35}Br^{80}_{45}$ 4.4^h	γ (0.049) s;ce$^-$ L_I/L_{III} = 1 (M3)	J. W. Mihelich, Phys. Rev. 87, 646 (1952).
$_{42}Mo^{93}_{51}$	Nb^{93}(p,n) n's first observed for E_p = 2.68	H. B. Willard et al., ORNL-1278, Dec. 1951.
$_{43}Tc^{99}_{56}$	β^- 0.290 s C_2T fits spectral shape	L. Feldman, C. S. Wu, Phys. Rev. 87, 1091(1952).
5.9^h	γ (0.140) s;ce$^-$ L_I/L_{III}>10 (M1)	J. W. Mihelich, Phys. Rev. 87, 646 (1952).
$_{44}Ru^{94}_{50}$	τ 57^m p 54^{m}Tc(2.7β^+)	A. van der Wiel, A. H. Aten, Physica 18, 356(1952). Mo(α); chem.
$_{44}Ru^{103}_{59}$	τ 39.8^d β_1^- ~99% 0.217 s β_2^- ~1% 0.70 γ 0.498 ce$^-$,pe$^-$ α~0.01 (β_1^-)(0.498γ) No (β^-) e$^-$(0.040γ) ; no $\gamma\gamma$	E. Kondaiah, Arkiv för Fysik 4, 81 (1952); Phys. Rev. 79, 891(1950). Ru(pile n).
$_{45}Rh^{103}_{58}$ 57^m	γ 0.040 s;ce$^-$ α~∞ K/LM~0.2 E3 ?	E. Kondaiah, Arkiv för Fysik 4, 81 (1952); Phys. Rev. 79, 891(1950).
$_{48}Cd^{111}_{63}$	μ(0.247 level) $\gamma\gamma(\theta)$ −0.70	H. Aeppli et al., Helv. Phys. Acta 25, 339(1952).
$_{48}Cd^{114}_{66}$	Levels Cd^{113}(n,γ) 12 capture γ's scin	R. W. Pringle et al., Phys. Rev. 87, 1016 (1952).
$_{49}In^{114}_{65}$ 72^s	β^- 96% 1.984 s β^+ 0.015% 1.0−1.4 a γ 3.6%* 0.556 s;pe$^-$ 0.1% 0.576 3.5% 0.722 0.02% 1.271 0.12% 1.300 No 1.85γ (<0.25 of 1.3γ) (1.300γ)(0.556γ)	M. W. Johns et al., Phys. Rev. 87, 1134(1952). *Photon %'s per disintegration, based on α = 4 for 0.192 γ of 50^d In^{114}.
$_{50}Sn^{115}_{65}$	In^{115}(p,n) n's first observed for E_p = 2.96	H. B. Willard et al., ORNL-1278, Dec. 1951.
$_{50}Sn^{117}_{67}$ 14.5^d	γ (0.155) s;ce$^-$ L_I/L_{III}~1 (M4)	J. W. Mihelich, Phys. Rev. 87, 646 (1952).
$_{50}Sn^{119}_{69}$ 250^d	γ (0.024) s;ce$^-$ L_I/L_{III}>10 (M1)	J. W. Mihelich, Phys. Rev. 87, 646 (1952).
$_{52}Te^{123}_{71}$ 90^d	γ (0.089) s;ce$^-$ L_I/L_{III}~0.5 (M4) (0.159) L_I/L_{III}>10 (M1)	J. W. Mihelich, Phys. Rev. 87, 646 (1952).
$_{53}I^{131}_{78}$	γ (0.080) s;ce$^-$ L_I/L_{III}>10 (M1)	J. W. Mihelich, Phys. Rev. 87, 646 (1952).
$_{55}Cs^{134}_{79}$ 3.15^h	γ (0.128) s;ce$^-$ L_{II}/L_{III}~1 (E3)	J. W. Mihelich, Phys. Rev. 87, 646 (1952).
2.3^y	I 4 M μ +2.96 M	V. Jaccarino et al., Phys. Rev. 87, 676 (1952). Cs(pile n); ms.
$_{57}La^{138}_{81}$	τ_K 7×10^{10}y τ_β 1.2×10^{12}y β^- or e$^-$ 1.0 a Ba K x rays	G. I. Mulholland, T. P. Kohman, Phys. Rev. 87, 681 (1952).
$_{58}Ce^{141}_{83}$	No β^+ β^- 70% 0.444 s 30% 0.582 γ 0.143 s;ce$^-$ α~0.5 E2,M1 K/L~6.5	E. Kondaiah, Arkiv för Fysik 4, 81 (1952); Phys. Rev. 83, 471(1951). Ce(pile n).

$_{58}Ce^{141}_{83}$	γ (0.141) scin $\alpha_K = 0.46$ K/LM = 5 M1,E2		R. L. Heath, Phys. Rev. 87, 1132 (1952).
	γ 0.142 scin $\alpha_K = 0.48$ M1,E2		S. A. E. Johansson, Arkiv för Fysik 3, 533(1952). Ce(pile n).
	No 0.315 γ		
$_{58}Ce^{143}_{85}$	τ 34^h		E. Kondaiah, Arkiv för Fysik 4, 81 (1952); Phys. Rev. 83, 471(1951). Ce(pile n). *Relative β and photon %'s.
	β^- 0.37 ? s 40%* 1.09 30% 1.37		
	I(γ) E_γ α_K K/L		
	γ_1 - 0.057 - 1		
	γ_2 70%* 0.283 0.03 6		
	γ_3 15% 0.649 0.01 -		
	γ_4 15% 0.705 - -		
	No 0.348 γ γ_2(E2 or M1); γ_3(E2 or M1) (>0.930β^-)(γ)		
$_{59}Pr^{143}_{84}$	β^- 0.915 s		E. Kondaiah, Arkiv för Fysik 4, 81 (1952); Phys. Rev. 83, 471(1951).
$_{60}Nd^{147}_{87}$	τ 11.6^d		E. Kondaiah, Arkiv för Fysik 4, 81 (1952); Phys. Rev. 81, 1056(1951). Nd(pile n). *Relative β and photon %'s.
	β^- ~33%* 0.35 s ~67% 0.78 s		
	γ 66%* 0.091 ce^-,pe^- $\alpha_K = 0.8$ K/L = 6.5 M1		
	32% 0.522 pe^-		
	~ 2% 0.310, 0.392 impurity ?		
	γ (0.091) sl;ce^- K/L = 7.6 K/LM = 6.9 M1		A. B. Smith, A. C. G. Mitchell, Phys. Rev. 87, 1128 (1952). Fission.
$_{61}Pm^{141}_{80}$	τ 20^m β^+ ~2.6 s γ		V. Kistiakowsky, Phys. Rev. 87, 859 (1952). Nd^{142}(20 Mev p); yield. Not produced by Pr(35 Mev α).
$_{61}Pm^{142}_{81}$	τ <2^m or >100^y No activity observed from Nd^{142}(11 Mev p) and Pr^{141}(36 Mev α)		V. Kistiakowsky, Phys. Rev. 87, 859 (1952).
$_{61}Pm^{143}_{82}$ $_{61}Pm^{144}_{83}$	τ $200-400^d$ β or e^- 0.6 a γ 0.17 scin 0.44 0.65 K,L x rays		V. Kistiakowsky, Phys. Rev. 87, 859(1952). Pr(15 Mev α), Nd^{143}(9 Mev p), Nd^{144}(9 Mev p); ion chem.
$_{61}Pm^{146}_{85}$	τ $\sim 1^y$ β^- ~0.7 a		V. Kistiakowsky, Phys. Rev. 87, 859 (1952). Nd^{146}(9 Mev p); yield.
$_{61}Pm^{148}_{87}$ 42^d	τ_2 42^d β^- 93% 0.7 a 7% 2.7 a γ ~1.0 a K x rays ?		V. Kistiakowsky, Phys. Rev. 87, 859 (1952). Nd^{148}(9 Mev p).
$_{61}Pm^{149}_{88}$	τ 54^h β^- 1.0 s,a γ ~0.3 scin K x rays		V. Kistiakowsky, Phys. Rev. 87, 859 (1952). Nd^{150}(9 Mev p); yield; ion chem.
	τ 50^h β^- 1.05 s No e^-		E. Kondaiah, Arkiv för Fysik 4, 81 (1952); Phys. Rev. 81, 1056(1951). Nd(pile n).
$_{61}Pm^{150}_{89}$	τ 2.7^h β^- 70% 2.01 s$\pi\sqrt{2}$ 30% 3.00 s$\pi\sqrt{2}$ γ 0.3 a 1.4 a		V. Kistiakowsky, Phys. Rev. 87, 859 (1952). Nd^{150}(9 Mev p); ion chem.
$_{62}Sm^{151}_{89}$	τ $\sim 70^y$ ms		D. G. Karraker et al., Phys. Rev. 87, 901(1952). Fission.
$_{62}Sm^{153}_{91}$	β^- 0.700 a$\beta\gamma$ 0.800 scin γ ~4%* 0.0695 scin α>10 26% 0.101 α~3 X 70%		R. C. Bannerman, Proc. Phys. Soc. London 65A, 565 (1952). *Relative photon %'s.
	(0.700β^-)(0.101γ), $\gamma\gamma$ No 0.6γ (<0.005%) E_{dis} = 0.800 scin		
	β^- 0.70 sl γ_1 ~10%* 0.07 sl;ce^- $\alpha \gg 1$ γ_2 100%* 0.103 sl,scin α_K = 0.65, K/L~6 γ_3 w 0.53 scin $e_1^- e_2^-$ [(0.17β)e_{K2}](θ) = const**		K. Siegbahn, Arkiv för Fysik 4, 223 (1952). *Rel. transition %'s. **Sm_2O_3 source.
	γ 0.070 scin α_K = 3.8 M1,E2 0.102 α_K = 1.3 M1,E2 K/L = 3.5		F. K. McGowan, ORNL-1278, Dec. 1951.
$_{63}Eu^{152}_{89}$ 5.3^y	τ 13^y ms		D. G. Karraker et al., Phys. Rev. 87, 901(1952). Eu(pile n); ion chem.
	β^- 0.75 s,βce^- [0.75β^-][e^-(0.336γ)] 0.122γ follows K		L. Y. Shavtvalov, Zhur. Eksptl'. i Teoret. Fiz. 21, 1123(1951); NSA 6-3717.

$_{63}Eu^{154}_{91}$	τ	16^y	ms		D. G. Karraker et al., Phys. Rev. 87, 901(1952). Eu(pile n); ion chem.
$_{66}Dy^{165}_{99}$ 1.25^m	γ	(0.109)	s;ce$^-$		J. W. Mihelich, Phys. Rev. 87, 646 (1952).
		L_{II}/L_{III} = 1.5			
		(E3)			
$_{67}Ho^{166}_{99}$	τ	27.5^h	s		N. M. Anton'eva et al., Izvest. Akad. Nauk USSR Ser. Fiz. 14, 299 (1950); Chem. Abs. 45, 459 i (1951).
	β^- 15%	0.66			
	85%	1.84			
	γ	0.081	s;ce$^-$		
		~1.3	a		
$_{69}Tm^{170}_{101}$	γ	0.084	sl		K. Siegbahn, Arkiv för Fysik 4, 223 (1952). *Tm_2O_3 source.
		K/LM = 0.1			
	e^-_K/total β = 0.013				
	$[(0.65\beta)e^-](\theta)$ = const*				
$_{72}Hf^{181}_{109}$	γ	0.132			F. K. McGowan, ORNL-1278, Dec. 1951.
		α_K = 0.51			
$_{75}Re^{188}_{113}$	β^- complex?		sl		R. Richmond et al., Proc. Phys. Soc. London 65A, 484 (1952). Re(slow n). *Photon %'s per disintegration.
		2.07			
	γ_1 70%*	0.152	pe$^-$,ce$^-$		
		α_K = 0.046 E1 ?			
		K/L = 0.42 E2 ?			
	γ_2 3%	0.476	pe$^-$		
	γ_3 6%	0.638	pe$^-$		
	γ_4 5%	0.933	pe$^-$		
	γ_5 5%	1.32	a		
	$(\gamma_4)(\gamma_2,\gamma_3)$; $(\gamma_1)(\gamma_2,\gamma_3)$;				
	$(\gamma_1)(\gamma_4,\gamma_5)$				
	$(>1.5\beta)(\gamma_1)$; $(\beta)(>0.15\gamma)$				
$_{76}Os^{189}_{113}$	I	½	S		K. Murakawa, S. Suwa, Phys. Rev. 87, 1048(1952); 83, 1258(1951).
	μ	+0.7			
	q	+2.0			
$_{76}Os^{191}_{115}$	β^-	0.143	s		E. Kondaiah, Arkiv för Fysik 4, 81 (1952); 3, 47(1951). Os(pile n). Author assigns to Os^{193}.
	γ	0.042	ce$^-$		
		L/M = 1.8			
		0.128			
		α_K~0.5	E2		
		K/L = 2.1			
	β^-e^- indicate one β^-				
	γ	0.124	scin		S. A. E. Johansson, Arkiv för Fysik 3, 533(1952). Os(pile n).
		α_K = 3.2			
	Author assigns to Os^{193}				
$_{77}Ir^{191}_{114}$	I	½	S		K. Murakawa, S. Suwa, Phys. Rev. 87, 1048(1952).
	μ	+0.16			
	q	+1.0			
$_{77}Ir^{192}_{115}$ 70^d	β^-	0.66		s	V. S. Shpinel, N. V. Forafontov, Zhur. Eksptl'. i Teoret. Fiz. 21, 1376(1951). *Relative photon %'s.
	γ 4%*	0.207		s;pe$^-$	
	3%	0.277	w	0.432	
	80%	0.296	130%	0.467	
	80%	0.308	6%	0.478	
	100%	0.315	10%	0.586	
	4%	0.401	17%	0.606	
	1.5%	0.417	6%	0.614	
$_{77}Ir^{192}_{115}$ 70^d	New γ's in β^- decay*				K. I. Roulston, R. W. Pringle, Phys. Rev. 87, 930 (1952). *In addition to γ's of J. M. Cork et al., Phys. Rev. 82, 258 (1951).
	0.16	0.76			
	~0.43	0.88			
	0.57 ?	0.9–1.2			
	0.74		scin,$\gamma\gamma$		
	E_{dis} = 1.58 ± 0.03		scin		
$_{77}Ir^{193}_{116}$	I	½	S		K. Murakawa, S. Suwa, Phys. Rev. 87, 1048(1952).
	μ	+0.17			
	q	+1.0			
$_{79}Au^{196}_{119}$	γ	(0.411)	s;ce$^-$		J. W. Mihelich, Phys. Rev. 87, 646 (1952).
		L_{II}/L_{III} = 2.5			
		(E2)			
$_{79}Au^{199}_{120}$	γ	(0.159)	s;ce$^-$		J. W. Mihelich, Phys. Rev. 87, 646 (1952).
		L_{II}/L_{III} = 1.6			
		(E2)			
	γ_1	0.050	sl,scin		K. Siegbahn, Arkiv för Fysik 4, 223 (1952). *$AuCl_3$ source.
	γ_2	0.158			
	γ_3	0.208			
		α_K / 0.24	α_L / 0.33	α_M / 0.10	
	γ_2				
	γ_3	~0.6	~0.1	~0.03	
	βe^-_1, βe^-_2, βe^-_3, $e^-_1 e^-_2$, no $e^-_2 e^-_3$				
	$[(0.10\beta)e^-_2](\theta)$ = const*				
$_{80}Hg^{203}_{123}$	γ	0.286	scin		S. A. E. Johansson, Arkiv för Fysik 3, 533(1952). Hg(pile n).
		α_K = 0.21	E3		
$_{81}Tl^{208}_{127}$	γ_X	2.61425 ± 0.00050			G. Lindström, Phys. Rev. 87, 678(1952).
	Hρ = 9986.7 ± 1.5 gauss-cm				
	(based on p resonance)				
Pb	Isotope shift				T. E. Manning et al., Phys. Rev. 78, 417 (1950).
	(204-206)/(206-208) = 0.85				
	(206-207)/(207-208) = 0.66				
	for PbI, λ = 4058				
	Isotope shift				K. Murakawa, S. Suwa, J. Phys. Soc. Japan 5, 382(1950).
	(204-206)/(206-208) = 0.89				
	(206-207)/(207-208) = 0.62				
	for PbI, λ = 4058				
	Isotope shift				P. Brix et al., Z. Physik 133, 192 (1952).
	(208-210)/(206-208) = 1.74				
	for PbI, λ = 4058				
$_{82}Pb^{212}_{130}$	$[0.17\beta][e^-_K(0.24\gamma)](\theta)$ = const				K. Siegbahn, Arkiv för Fysik 4, 223 (1952).
$_{83}Bi^{212}_{129}$	α	6.046		s	E. R. Collins et al., Nature 167, 682 (1951).
		6.090			
	β^- 66.0%			ppl	S. Tokunaga, Mem. Coll. Sci. Univ. Kyoto 26A, 109 (1950).
	α 34.0%				
$_{84}Po^{210}_{126}$	α	5.304		s	E. R. Collins et al., Nature 167, 682 (1951).

$_{84}Po^{212}_{128}$	α	8.785	s	E. R. Collins et al., Nature 167, 682 (1951).
$_{88}Ra^{226}_{138}$	σ(th n,$\gamma\beta$)Ac^{227} ~19			S. Peterson, NNES 14B, Paper 19.9.
$_{92}U^{235}_{143}$	α	4.39	ic	R. Vestergaard, E. Haeffner, Arkiv för Fysik 3, 557 (1952).
$_{95}Am^{241}_{146}$	γ 6.9%* 0.0263		pc	J. K. Beling et al., Phys. Rev. 87, 670 (1952); 86, 797 (1952); 87, 1144 (1952). Pu^{239}(n,γ; n$\gamma\beta$). *Relative photon %'s.
	α<20			
	100%* 0.0597			
	α<1.5		scin	
	$\tau = 0.063^{\mu s}$			
	~0.5% 0.075 ?			
	Levels at 0.114 and 0.043 (from α's) have τ's <$0.15^{\mu s}$, <$0.3^{\mu s}$			
	Np L x rays			

Q's Between Ground States

Cu^{63}(p,n)Zn^{63}	−4.13 ± 0.02	H. B. Willard et al., ORNL-1278(1951).
Cu^{65}(p,n)Zn^{65}	−2.13 ± 0.02	
Cd^{113}(n,γ)Cd^{114}	+9.2	R. W. Pringle et al., Phys. Rev. 87, 1016 (1952).

A cumulation of the New Nuclear Data appearing in Issues No. 1 through 23 of this volume will appear separately, as Issue No. 24B, and will constitute a fourth supplement to "Nuclear Data," NBS circular 499.